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inches. The ratio of the aperture to the focal length has been taken larger than can be adopted in practice, in order to exaggerate the amount of curvature. It will be seen that the curves in the systems of Gauss and Fraunhofer may be nearly represented by the two solutions of Herschel's equations.*

It follows that Gauss's form, originally designed to secure a more complete elimination of the chromatic dispersion, must be also rather favorable than otherwise as regards the correction of the aberration of figures. It may be remarked, further, that his investigation, neglecting the thickness and distance of the lenses, leads to an equation of the fourth degree, which has no solution corresponding to V., nor to the above values of the radii used by Fraunhofer. On the other hand, if the curves in III. and V. have been derived from substantially the same theory, which seems a probable inference, it is scarcely possible that Fraunhofer should not have had at some time under consideration the system represented by the other solution of the equations, which would have conducted to forms approximating very nearly to the system of Gauss.

Five hundred and twenty-seventh Meeting.

November 11, 1863. — STATUTE MEETING.

The PRESIDENT in the chair.

Professor Cooke reported that no purchases of books for the Library had been made since the annual meeting. The Academy voted to continue without change the list of periodicals.

The President presented the following report from the Council: —

* The refractive and dispersive powers in III., and probably in II., differ by small amounts from those used in computing IV. and V.; moreover, in the latter, the effect of the thickness of the lenses and of their distance from each other has not been included, so that the numbers to be strictly comparable would require a small correction. The values V., computed with the elements of refraction and dispersion used for III., neglecting only the correction for thickness, become

| | |
|---|--------|
| | ft. |
| + | 14.212 |
| + | 6.349 |
| — | 6.488 |
| + | 25.375 |
| | 21.00 |

A proposition in reference to the administration of the Vatican Library, laid before the Academy at the anniversary meeting, was referred to the Council for consideration.

The Council is deeply sensible of the interest and importance of the movement proposed by Dr. Beck. The system adopted by the Papal Authorities for the use, or rather the *disuse*, of the literary manuscripts of that great collection, has been explained to the Council by Dr. Beck, from his own experience. Nothing can be more desirable to those engaged in historical and philological investigations, nor more useful to the cause of learning, than the relaxation of the rigid rules which virtually exclude scholars from all inspection and examination of the manuscripts in the Vatican. Learned men, and especially learned societies throughout the world, it is thought, may with propriety protest against this system, and solicit a change.

The Council would suggest, however, that the Academy may wisely refrain from adopting the political expressions contained in the preamble with which the resolves under consideration are connected; and would also express the opinion, that, in view of the importance and delicacy of this subject, its practical consideration may advantageously be devolved upon a committee of the executive officers of the Academy, who can, at their discretion, seize upon any favorable opportunities that may offer from time to time for the representation of the case; acting under the following resolution, — which is herewith reported as a substitute for those referred to its consideration, viz. : —

Resolved, That the President, Vice-President, and the Secretaries of the Academy be a committee to correspond with the American Minister at Rome, and also with the American Minister at Turin, if they think it expedient, on the subject of securing greater liberality in the administration of the Library of the Vatican, and particularly with a view to secure to scholars an opportunity of examining its rare and valuable manuscripts.

The resolution was adopted.

The vacancy in the Rumford Committee, occasioned by the resignation of Professor Eliot, was filled by the election of Professor Gibbs.

Henry C. Carey of Philadelphia, and George Bancroft of New York, were elected Associate Fellows, in Class III., Section 4.

John P. Kennedy of Baltimore, and Frederic E. Church of New York, were elected Associate Fellows, in Class III., Section 4.

William Lawrence of London was elected a Foreign Honorary Fellow, in place of the late Sir Benjamin C. Brodie, of Class II., Section 4.

Dr. Edward Jarvis was elected Resident Fellow in Class II., Section 3.

Professor Bond communicated "A List of New Nebulæ seen at the Observatory of Harvard College, 1847-1863."

An examination of the notes relating to the positions and appearance of nebulae and star-clusters, occurring in the record-books of the Observatory for the last fifteen years, has furnished the accompanying list of objects which have not been identified in published catalogues. As the number of observations compared has amounted to several hundred, most of the nebulae of course having been previously seen elsewhere, it is quite possible that a few of those entered on the list may be accounted for by errors in the observed places, or by supposing them to be merely groups of a few small stars indistinctly seen. This might the more easily have happened, since the nebulae have, in most instances, been met with by accident, while sweeping for comets, or in the passage of zones of stars. In such cases, but little time could be given to determining the positions, or to a close scrutiny of the object; the list has been divided into two sections, the second comprising objects rather doubtful as to their position or identity as nebulae.

I. *List of new Nebulae and Star-clusters seen at the Observatory of Harvard College.*

(1.) A small faint nebula, 1' north-following a star of the 11th magnitude, seen Sept. 16th, 1863, by G. P. Bond, with the Great Refractor.

$$1863.0 \alpha = 0^h 35^m 10^s.2 \pm 0^s.4 \quad \delta = + 0^\circ 8' 54'' \pm 20''$$

(2.) A small, round, pretty bright nebula, diameter 45'', seen Jan. 5th, 1853, by G. P. Bond, with the Great Refractor. (In Harvard Zones.) Re-observed Sept. 16th, 1863.

$$1863.0 \alpha = 0^h 35^m 15^s.2 \pm 0^s.4 \quad \delta = + 0^\circ 5' 24''.0 \pm 15''$$

The nebulae h. 39 — 41 and 43 precede the above nearly in the same declination.

(3.) A faint nebula $1' 30''$ south-following a star of the 11th magnitude, seen Jan. 8th, 1853, with the Great Refractor, by G. P. Bond. (In Harvard Zones.)

$$1853.0 \alpha = 0^h 59^m 52^s \quad \delta = + 0^\circ 8' 52''$$

(4.) A faint nebulosity, seen Jan. 25th, 1860, by Sidney Coolidge, with the Great Refractor. (In Harvard Zones.)

$$1860.0 \alpha = 3^h 6^m 55^s.2 \quad \delta = + 0^\circ 55' 32''.5$$

(5.) A faint nebulosity, seen Dec. 16th, 1859, by Sidney Coolidge, with the Great Refractor. (In Harvard Zones.)

$$1860.0 \alpha = 3^h 16^m 29^s.0 \quad \delta = + 0^\circ 40' 57''.0$$

(6 and 7.) Two clusters, seen March 19th, 1863, by T. H. Safford, near two stars of the 10–11th magnitude, with the Great Refractor. (In Harvard Zones.)

$$\begin{aligned} \text{Positions of stars:—} 1863.0 \alpha &= 6^h 4^m 44^s.9 & \delta &= + 1^\circ 8' 37'' \\ &= 6 \ 5 \ 47.2 & &= + 1 \ 10 \ 2 \end{aligned}$$

(8.) A cluster, seen March 19th, 1863, by T. H. Safford, between two stars in the following position, with the Great Refractor. (In Harvard Zones.)

$$\begin{aligned} \text{Star of 10-11 mag. } 1863.0 \alpha &= 6^h 6^m 27^s.8 & \delta &= + 1^\circ 1' 10'' \\ \text{" } 9-10 \text{ " } &= 6 \ 7 \ 12.7 & &+ 1 \ 0 \ 27 \end{aligned}$$

(9 and 10.) Two faint nebulae seen Feb. 26th, 1853, with the Great Refractor, by G. P. Bond. (In Harvard Zones.)

$$1853.0 \alpha = 7^h 22^m 15^s \quad \delta = + 0^\circ 5' 11''$$

It is not stated to which one of the pair this position belongs. The two are probably quite near each other.

(11.) A very faint comet-like nebula, seen Sept. 1st, 1852, with the Great Refractor, by G. P. Bond.

$$1852.0 \alpha = 7^h 54^m 44^s \quad \delta = + 20^\circ 35'.8$$

Nebula north-preceding star of 9th mag. B. Z. 277

$$\Delta \alpha = - 0^m 27^s.05 \quad \Delta \delta = + 2' 42''.2$$

(12.) A nebulous object, seen March 31st, 1859, by Sidney Coolidge, with the Great Refractor. (In Harvard Zones.)

$$1859.0 \alpha = 9^h 59^m 48^s \pm 4^s \quad \delta = + 0^\circ 45'.0 \pm 2'$$

(13.) A faint nebulous object, seen March 31st, 1859, by Sidney Coolidge, with the Great Refractor. (In Harvard Zones.)

$$1859.0 \alpha = 10^{\text{h}} 16^{\text{m}} 11^{\text{s}} \quad \delta = +0^{\circ} 46' 31''$$

(14.) A star of 12th magnitude in a faint nebosity, seen May 3d, 1859, by Sidney Coolidge, with the Great Refractor. (In Harvard Zones.)

$$1859.0 \alpha = 12^{\text{h}} 30^{\text{m}} 57^{\text{s}}.4 \quad \delta = +0^{\circ} 57' 33''.4$$

(15.) A star of 12th magnitude in a faint nebosity, seen April 30th, 1859, by Sidney Coolidge, with the Great Refractor. (In Harvard Zones.)

$$1859.0 \alpha = 13^{\text{h}} 24^{\text{m}} 29^{\text{s}}.9 \quad \delta = +0^{\circ} 41' 49''.0$$

(16.) A star of 12th magnitude slightly nebulous, seen April 30th, 1859, by Sidney Coolidge, with the Great Refractor. (In Harvard Zones.)

$$1859.0 \alpha = 13^{\text{h}} 42^{\text{m}} 35^{\text{s}}.2 \quad \delta = +0^{\circ} 46' 15''.7$$

(17.) A small round nebula, seen June 8th, 1855, by G. P. Bond, with the Great Refractor. (In Harvard Zones.) Distant 2' from a star of the 9th mag. in the position

$$1855.0 \alpha = 13^{\text{h}} 49^{\text{m}} 3^{\text{s}} \quad \delta = +0^{\circ} 30' 20''$$

(18.) A nebulous star of 12th magnitude, seen April 29th, 1859, by Sidney Coolidge, with the Great Refractor. (In Harvard Zones.)

$$1859.0 \alpha = 13^{\text{h}} 53^{\text{m}} 54^{\text{s}}.9 \quad \delta = +0^{\circ} 46' 24''.3$$

(19.) A nebula seen May 9th, 1853, with the Great Refractor, by G. P. Bond. (In Harvard Zones.)

$$1853.0 \alpha = 14^{\text{h}} 21^{\text{m}} 48^{\text{s}} \quad \delta = +0^{\circ} 13' 9''$$

(20.) A round nebula seen May 9th, 1853, with the Great Refractor, by G. P. Bond. (In Harvard Zones.)

$$1853.0 \alpha = 14^{\text{h}} 23^{\text{m}} 39^{\text{s}} \quad \delta = +0^{\circ} 20' 9''$$

(21.) An elongated nebula, fainter than the above, seen May 9th, 1853, by G. P. Bond, with the Great Refractor. (In Harvard Zones.)

$$1853.0 \alpha = 14^{\text{h}} 24^{\text{m}} 24^{\text{s}} \quad \delta = +0^{\circ} 17' 9''$$

(22.) An elongated faint nebula, longest diameter 80'', seen Sept. 1st, 1859, with the Comet-seeker, by H. P. Tuttle.

$$1859.0 \alpha = 18^{\text{h}} 23^{\text{m}} 37^{\text{s}} \quad \delta = +74^{\circ} 30'.2$$

The position given is that adopted by Auwers, William Herschel's *Verzeichnisse von Nebelflecken und Sternhaufen*, p. 75.

(23.) A faint nebula following a star of the 10th magnitude $0^m 1^s.0$, and $1' 29''$ north of it, seen Nov. 24th, 1852, by G. P. Bond, with the Great Refractor. (In Harvard Zones.)

$$1852.0 \alpha = 19^h 56^m 14^s.5 \quad \delta = +0^\circ 1' 48''$$

(24.) A nebula seen Feb. 10th, 1848, by G. P. Bond, with the Great Refractor.

$$1848.0 \alpha = 21^h 44^m 46^s \quad \delta = +49^\circ 2'.9$$

(25.) A nebula seen Oct. 23d, 1848, with the Great Refractor, by G. P. Bond.

$$1848.0 \alpha = 23^h 24^m 56^s \quad \delta = -6^\circ 26' 10''$$

Nebula north-preceding star of 9th mag.

$$\Delta \alpha = -0^m 18^s.19 \quad \Delta \delta = +1' 12''.7$$

II. The following are the positions of objects supposed to be nebulae, but requiring verification.

(26.) A nebula quite faint, $3^\circ 30'$ north of γ Cassiopeia, and in the same right ascension with it. Seen Feb. 27th, 1850, by G. P. Bond, with the Comet-seeker.

$$1850.0 \alpha = 0^h 47^m 41^s \pm 1^m \quad \delta = +63^\circ 24' \pm 10'$$

Looked for, but could not be found, Sept. 9th, 1863.

(27.) A faint, small, round nebula 8° north-preceding Capella. Seen by G. P. Bond with the Comet-seeker, Feb. 18th, 1851.

$$1851.0 \alpha = 4^h 33^m + 3^m \quad \delta = +53^\circ 0' \pm 30'$$

(28.) A small nebula, seen near κ Orionis, Oct. 6th, 1850, by G. P. Bond, with the Comet-seeker.

$$1850.0 \alpha = 5^h 37^m 43^s \pm 20^s \quad \delta = -10^\circ 8' 39'' \pm 5'$$

(29.) A nebulous object (?), seen May 3d, 1859, by Sidney Coolidge, with the Great Refractor. (In Harvard Zones.)

$$1859.0 \alpha = 12^h 12^m \quad \delta = +0^\circ 56'$$

(30.) A faint, rather large nebula, one third of the distance from Arcturus to α Corona Borealis, and in a line with the last-named star. Seen by G. P. Bond with the Comet-seeker, Dec. 30th, 1850.

$$1850.0 \alpha = 14^h 37^m \pm 3^m \quad \delta = +23^\circ 0' \pm 30'$$

Looked for, but not found, Aug. 17th, 1863.

(31.) A nebulous star, seen Nov. 15th, 1859, by Sidney Coolidge, with the Great Refractor. (In Harvard Zones.)

$$1859.0 \alpha = 22^{\text{h}} 46^{\text{m}} \qquad \delta = + 0^{\circ} 44'$$

(32.) A nebula resembling a comet, seen Nov. 7th, 1850, by G. P. Bond, with the Comet-seeker.

$$1850.0 \alpha = 23^{\text{h}} 50^{\text{m}} 46^{\text{s}} \qquad \delta = - 33^{\circ} 24'$$

III. Positions of known nebulae have been observed as follows:—

h. 555. Faintly seen in the Comet-seeker, March 25th, 1852. Compared by G. P. Bond with a star of 9.5 mag. Arg. Sternverzeichniss + 60° 1175. Nebula south-following star.

$$\Delta \alpha = + 0^{\text{m}} 26^{\text{s}}.25 \qquad \Delta \delta = - 1' 57''.8$$

h. 90. Compared with a star of 7th magnitude B.A.C. 357, by G. P. Bond. Nebula north-preceding star.

$$\Delta \alpha = - 0^{\text{m}} 43^{\text{s}}.0 \qquad \Delta \delta = + 2' 44''.5$$

The nebula discovered by Schönfeld in 1858, and numbered 17 in Auwers's catalogue of new nebulae, was also discovered independently by H. P. Tuttle, Feb. 5th, 1859, as "a nebulosity attached to a star of the 9–10 mag. which follows its centre six seconds and is two minutes north of it." It was visible in the Comet-seeker and in the Finder of the Great Refractor. No. 45 of the same catalogue, discovered by Winnecke in 1853, was also discovered independently by H. P. Tuttle, July 27th, 1859. It appeared as a faint cometary object in the Comet-seeker, but in the Great Refractor as a cluster just resolved of 2' or 3' in diameter.

The nebula H, III. 447 was observed Feb. 7th, 1863, with the Great Refractor, by G. P. Bond. Diameter 40'', with a faint star or appendage on the north-following side.

Nebula north-preceding star of 8th mag. H. C. 10303, Sept. 9th, 1863.

$$\Delta \alpha = - 0^{\text{m}} 34^{\text{s}}.10 \qquad \Delta \delta = + 2' 47''.3$$

The nebula H, I. 288 was observed by G. P. Bond, April 8th, 1859, as follows:—

Nebula north-following star α of 7–8th mag. Oeltzen 9183.

$$\Delta \alpha = + 5^{\text{m}} 0^{\text{s}}.88 \qquad \Delta \delta = + 4' 15''.5$$

Nebula north-preceding star b of 8–9th mag. Oeltzen 9305.

$$\Delta \alpha = - 2^{\text{m}} 57^{\text{s}}.75 \qquad \Delta \delta = + 4' 15''.5$$

The nebula H. IV. 33, in the position $1830.0\ 5^h\ 28^m\ 7^s$, $\delta - 6^\circ\ 51'$, described by W. Herschel as "a star with a milky chevelure or v. B. nucleus with milky nebulosity," appears in the Great Refractor as a fine annular nebula or cluster, very much concentrated on the following side almost to a stellar centre.

Professor Cooke gave a description of a new and improved Spectroscope made by Mr. Alvan Clarke. It has nine prisms of plane glass sides filled with bisulphide of carbon, which are so mounted and arranged that they are capable of easy adjustment to the angles of least deviation in the refracted ray. By this instrument Professor Cooke has been able to discover a much greater number of lines in the solar spectrum and in metallic spectra than have hitherto been observed.

Dr. Gray presented the two following papers: —

On STREPTANTHUS, Nutt., and the Plants which have been referred to that Genus. By ASA GRAY.

A number of plants have been referred to *Streptanthus*, — some by its founder, Nuttall, and others by myself, — which, upon re-examination, appear to belong elsewhere. Having now before me all the authentic materials which exist in herbaria in this country, I have endeavored to clear up the group, with the following results.

1. STREPTANTHUS, Nutt.

The characters of this genus are the linear or elongated and sagittate anthers, and petals with long canaliculate claws (with or without a dilated lamina), along with the flattened siliques and broad flat seeds of *Arabis*. *Iodanthus*, Torr. & Gray, and *Thelypodium*, Endl. (*Pachypodium*, Nutt.), which have long unguiculate petals and narrow anthers (which coil or curve when effete, like those of *Streptanthus*), have terete and torulose siliques, the valves with an obscure if any mid-nerve, and oblong seeds, the cotyledons in the latter obliquely more or less incumbent. There are transitions which connect, quite too closely, *Streptanthus* with *Arabis*. But the genuine species of the former are so strikingly marked, that the genus will probably be kept up. The disposition of the calyx to assume a crimson or purple color, and of the filaments of the longer stamens to unite in pairs, may also be taken into account. I recognize the following species.

§ 1. *EUSTREPTANTHUS*, Endl. Petals with a broad and ample plane lamina. Sepals suberect or erect. Seeds winged. Flowers pretty large, rose-purple. Cauline leaves all sessile and cordate-clasping, glabrous and more or less glaucous.

* Flowers all subtended by persistent bracts.

1. *S. BRACTEATUS*, Gray, Gen. Ill. 1, t. 60 ; Pl. Lindl. 2, p. 143, & Pl. Wright. 2, p. 11. Silique elongated-linear, 6 inches long, spreading. Mature seeds not seen. — Texas.

* * Flowers (or all but the lowest) ebracteate.

2. *S. PLATYCARPUS*, Gray, Pl. Wright. l. c. Siliques oblong-linear ($2\frac{1}{2}$ –3 lines wide), very flat, erect. Leaves clasping by rather short and rounded lobes, the lower and radical ones lyrate-pinnatifid. — S. W. Texas.

3. *S. MACULATUS*, Nutt. in Jour. Acad. Philad. 5, p. 134, t. 7. *S. obtusifolius*, Hook. Bot. Mag. t. 3317. *Brassica Washitana*, Muhl. Cat. ? Siliques narrowly linear (only a line wide, 3 or 4 inches long), erect or ascending. Cauline leaves clasping by long and obtuse lobes, making a very deep and nearly closed sinus. — Arkansas and E. Texas.

§ 2. *EUCLISIA*, Nutt. Petals undulate-crisped, the lamina narrow or attenuated, scarcely if at all broader than the claw. Sepals connivent, mostly colored, often saccate at the base. The longer stamens often connate.

* Flowers distinctly pedicelled. Stem not fistulous-inflated.

+ Wholly glabrous and mostly glaucous : cauline leaves clasping by a cordate or sagittate base.

4. *S. CARINATUS*, C. Wright, in Gray, Pl. Wright. 2, p. 11. Flowers purple (half an inch long) ; the urceolate calyx carinately 5-saccate. Pedicels of the flowers and of the broadly linear and flat (half-grown) siliques erect. Radical and lower cauline leaves runcinate-pinnatifid, the upper ones sagittate-clasping, all very glaucous. Seeds unknown. — S. W. Texas, below El Paso.

5. *S. CORDATUS*, Nutt. in Torr. & Gray, Fl. 1, p. 77. This, although marked with the exclamation point, as having been authenticated, is not preserved in any American herbarium, so far as I can ascertain. It is characterized by Nuttall as having very obtuse leaves, toothed near the summit, the cauline cordate and clasping, greenish-

yellow flowers on short pedicels, an oblong campanulate calyx, and deflexed siliques. The locality assigned by Nuttall is "Forests of the Rocky Mountains." An imperfect specimen gathered "on the Colorado" by Dr. Newberry may be of this species. Otherwise it is wholly unknown to me. I suppose it can be neither the foregoing nor the following species.

6. *S. TORTUOSUS*, Kellogg, in Proceed. Calif. Acad. 2, p. 152, t. 46, wood-cut. *S. cordatus*, Torr. Bot. Whipl. Exped. Pacif. R. R. Surv., p. (65) 9, not of Nutt. Flowers purple, on slender (spreading or ascending) pedicels, in a lax raceme, the lowermost often leafy-bracted, half an inch long; the (ovate) buds and the sepals usually long-acuminate. Siliques, according to Dr. Kellogg's figure and description, narrowly linear and falcately recurved-spreading. Seeds, according to Dr. Kellogg's description, wing-margined. Leaves entire or denticulate, the cauline cordate-clasping and mostly appearing as if perfoliate. Stem paniculately branched. — Dr. Kellogg's uncharacteristic name for this species refers only to the areolation of the septum of the silique. — California, on the Yuba River, Dr. Bigelow; and "the Copper region of the Sierra Nevada, Mr. C. D. Gibbs," Dr. Kellogg. The habitat is remote from that assigned for his *S. cordatus* by Nuttall, who, moreover, could never have omitted to notice the taper-pointed flower-buds and sepals, so conspicuous in Dr. Bigelow's specimens and Dr. Kellogg's figure. But I must remark that two specimens in Dr. Torrey's herbarium, collected in California by Mr. Gibbs (I presume the person who supplied Dr. Kellogg) have flowers with nearly obtuse buds and sepals, but in size and all other respects like the *S. tortuosus*. The "wing-margined seeds," noted by Dr. Kellogg, who alone has seen the fruit, should aid in distinguishing this species from the next.

7. *S. BREWERI*, n. sp. (Gray in Proceed. Calif. Acad. ined.) Flowers purple, on very short ascending pedicels, the lowest often leafy-bracted; the buds a quarter of an inch long, obtuse or barely acute; the sepals with scarious but recurved blunt tips. Siliques narrowly linear, ascending or erect, straight or slightly incurved ($1\frac{1}{2}$ — $2\frac{1}{2}$ inches long, less than a line wide), compressed, but torulose, the nerve of the valves obscure. Seeds wholly marginless. Glauous, annual, branched from near the base. Cauline leaves, except the lowest, strongly cordate-clasping with a closed sinus, entire or denticulate, the uppermost sagittate. California; collected in the State Geological Survey by Prof. William H. Brewer, at three stations, under the following forms: —

1st. In a dry ravine of Shasta Mountain, at the elevation of 8000 feet: a dwarf state, in flower only, a span high; the foliage resembling that of *Thlaspi perfoliatum*. 2d. On the Diablo Mountains, five degrees farther south, on the top of a dry mountain, alt. 3200 feet; in flower and fruit, 9 inches high. Flowers rather smaller, more numerous. Lower cauline leaves 2 inches long, very glaucous. 3d. On San Carlos, of the Mount Diablo range: in flower and fruit, with more naked and virgate branches, one or two feet high; the calyx hoary or downy, but otherwise the plant is quite glabrous and glaucous, as in the other forms.

+ + Wholly glabrous and somewhat glaucous: cauline leaves not cordate nor auriculate at the base, entire or very obscurely toothed. Flowers violet-purple.

8. *S. hyacinthoides*, Hook. Bot. Mag. t. 3516; Gray, Gen. Ill. 2, t. 61. *S. glabrifolius*, Buckley in Proceed. Acad. Philad. Flowers in the virgate raceme spreading and soon pendulous, green and violet-purple; the calyx cylindraceous. Siliques erect-spreading (2-4 inches long, a line wide). Seeds with a narrow wing. Leaves linear-lanceolate and oblong-linear.—E. Texas and the adjacent part of Arkansas.

+ + + More or less furnished with bristly simple hairs: cauline leaves or some of them usually auriculate- or sagittate-clasping and laciniate-toothed. Flowers, at least the calyx, crimson-purple or red.

9. *S. GLANDULOSUS*, Hook. Ic. t. 40. Cauline leaves narrowly lanceolate and mostly sagittate-clasping, their sparse teeth with callos rather than glandular tips. The lax raceme with the pedicels and flowers glabrous or nearly so; calyx ovate. Siliques narrowly linear (2 or 3 inches long, less than a line wide), straight or curved, ascending. Immature seeds slightly wing-margined. The cauline leaves are commonly sagittate and the siliques glabrous. But Dr. Brewer has collected a form with the leaves slightly auricled at the base, and the siliques beset with a few bristles.—California.

10. *S. HETEROPHYLLUS*, Nutt. in Torr. & Gray, l. c. Cauline leaves oblong and lanceolate and sagittate-clasping, mostly hispid. Pedicels in the lax raceme spreading in flower, deflexed in fruit, commonly (as well as the calyx) more or less hispid. Siliques deflexed, straight, very narrowly linear, teretish-subtetragonal, 3 or 4 inches long,

glabrous, tapering at the summit into a distinct style. Seeds wingless. In Nuttall's original specimens all but the lower pedicels and also the calyx are glabrous: in those of Coulter and of Xantus they are hispid, especially the pedicels. They have, in the fruit, a strongly 2-lobed stigma. In Nuttall's the stigma is only emarginate.— Southern part of California.

11. *S. HISPIDUS*, n. sp. (Gray in Proceed. Calif. Acad. ined.) Very dwarf (2 or 3 inches high, from an annual root), hispid throughout, even to the siliques. Leaves cuneate or obovate-oblong, coarsely toothed or incised, the cauline sessile, but hardly at all clasping. Raceme short and loosely flowered: pedicels spreading or at length recurved, but the linear compressed siliques ($1\frac{1}{2}$ inch long and a line wide) are erect. Stigma emarginate, almost sessile. Immature seeds winged. The flowers resemble those of the preceding species. The anthers are rather short for this genus, only linear-oblong, and blunt; but the longer filaments are connate. The whole body of the petal is a long, linear lamina, the base of which is contracted into a narrow claw.— California; on the dry summit of Monte Diablo, coll. William H. Brewer, California State Geological Survey.

+ + .+ + Sparingly hirsute with simple hairs or nearly glabrous: cauline leaves not clasping nor auriculate at the base, the lower sinuate or pinnatifid and contracted at the base into a margined petiole. Flowers yellowish or greenish-white.

12. *S. FLAVESCENS*, Hook. Ic. t. 44. Flowers ascending: calyx cylindraceous. Siliques erect, glabrous or sparingly hairy, teretish, pointed with a distinct style. Seeds probably wingless.— California. A very large or luxuriant form of this was gathered at the coal-mine near Monte Diablo by Dr. Brewer, 2 or 3 feet high, the lower leaves runcinate, the "greenish-white" flowers half an inch long; siliques half-grown.

* * Flowers sessile or nearly so. Stem fistulous-inflated.

13. *S. CRASSICAULIS*, Torr. in Stansbury, Rep. Salt Lake Exped. p. 384, t. 1. Leaves mostly radical, runcinate-pinnatifid. Calyx woolly. Petals dark purple. Silique unknown.— Utah.

Doubtful Species.

S. REPANDUS, Nutt. in Torr. & Gray. Fl. 1, p. 77, of the *Euclisia* section, from Santa Barbara, California, is known only from Nuttall's brief character.

2. *Species excluded from Streptanthus.*

S. sagittatus, Nutt. in Jour. Acad. Philad. 7, p. 12. The scanty original specimens of Wyeth are in flower only. The *S. sagittatus* of Hooker and Arnott, from the Snake Country (which in the suppl. to Fl. N. Amer. vol. 1, was referred to *S. angustifolius*, Nutt.) is apparently the same with smaller flowers. These specimens show a torulose terete silique and oblong seeds, in which the cotyledons probably are not truly accumbent. They are identical with *Pachypodium* (*Thelypodium*) *sagittatum*, Nutt. in Torr. & Gray, Fl.; and so, likewise, we may regard the larger-flowered specimens, until their fruit is known.

S. angustifolius, Nutt. in Torr. & Gray, Fl. l. c. To this certain narrow-leaved and smaller-flowered forms of the preceding species have been subsequently referred. But Nuttall's specimens, on which the species was founded, belong to *Turritis patula*, Graham, which is as good an *Arabis* as need be, — therefore *Arabis patula*.

S. angustifolius, Gray in Proceed. Acad. Philad. March, 1863, p. 67, coll. Hall and Harbour, no. 35, is *Turritis brachycarpa*, Torr. & Gray, Fl., a short-fruited form of *T. stricta*, Graham, which is a true *Arabis*, — *A. Drummondii*.

S. virgatus, Nutt. in Torr. & Gray, Fl. l. c., although not extant in any of our herbaria, I may rather confidently refer to *Arabis retrofracta*, Graham (*Turritis*, Hook. etc.), and *A. Höllbollii*, Hornem., probably the purple-red-flowered form which occurs west of the Rocky Mountains.

S. arcuatus, Nutt. l. c., which Mr. Wallace and Dr. Brewer have also collected in California, is another genuine wing-seeded *Arabis*, — *A. arcuatus*.

These last, with *Arabis blepharophylla*, Hook. (of which the fruit is unknown), have short, oval or barely oblong anthers, and there is nothing in their flowers to associate them especially with *Streptanthus*.

S. petiolaris, Gray, Pl. Fendl. &c. (to which belongs *S. Brazoensis* of Buckley), having short anthers, &c., must be referred to the wing-seeded division of *Arabis*, — *A. petiolaris*.

S. longifolius, Benth. Pl. Hartw. and *S. micranthus*, Gray, Pl. Fendl. (which is perhaps a form of *S. longifolius*), with short anthers, very narrow siliques, and wingless seeds, may probably be referred to *Arabis*. But the valves are so carinate that the silique appears almost tetragonal.

S. linearifolius, Gray, Pl. Fendl., has elongated acute anthers, in-

deed, and long-clawed petals; but, with its almost terete siliques, having an obscure stipe, and oblong seeds, it best accords with *Iodanthus*, Torr. & Gray, — which genus, again, is not well, if at all, to be distinguished from *Pachypodium*, Nutt. (*Thelypodium*, Endl.), and this name, though badly chosen, may have to be adopted. It would be better if we could settle upon the name of *Thelypodium*.

No. 684 (or 689?) of Coulter's Mexican collection, from Zimapan, appears to be a strict congener of *Iodanthus pinnatifidus*.

*A Revision and Arrangement (mainly by the fruit) of the
North American Species of ASTRAGALUS and OXYTROPIS.*
By ASA GRAY.

In view of the species known to him by the fruit, it was natural enough that Linnæus should distinguish from *Astragalus* his genus *Phaca*. Being established, and augmented with a considerable number of species, it is not surprising that the two genera should still have been maintained long after the neat carpological character which alone distinguished them was found in some cases to fail. Perhaps there are not very many large genera in botany which do not at some point graduate into some other. But in the present case, — not to refer to the eminent unsafeness of all leguminous genera founded on the legume alone, and to the inutility of genera which are not recognizable by habit or floral structure, — it has now become evident that the distinction between *Phaca* and *Astragalus* breaks down so completely and so variously, that the two genera are, as I suppose, no longer tenable. Indeed, from analogous instances we might expect that the intrusion into the cell of one or the other suture, even when, as here, quite constant in species, would not of itself be of generic consequence. An obvious alternative to combining these two Linnæan genera is to proceed further in division, by taking the form and texture of the legume into generic account. The manifold diversity which the fruit exhibits, and also the vastness of the group, would invite to this course. But a study even of the North American species only — especially as here grouped mainly in reference to the fruit — demonstrates its impracticability. In place of two genera with outlines here and there blended, we should have twenty, most of them still less definable. A partial attempt of this kind, probably one of the best that could be made, was that of Nuttall, in proposing his two genera, *Homalobus* and *Kentro-*

phyta, upon flat-podded species of what would otherwise belong to *Phaca*, the single species of the latter and some species of the former being quite peculiar in habit. But intermediate forms connect the compressed with the turgid and inflated legumes.

Used for sectional groups, these minor carpological characters may be turned to good practical account; for it is no great objection to such natural groups, as it is to genera, that they blend through gradations or have occasional exceptions.

It is in the botany of this country that the question of the distinction between *Phaca* and *Astragalus* is most pressing, and where the *data* for the answer are most largely to be found. While extra-tropical Asia is the focus of true *Astragalus*, that of *Phaca* is in America, mainly in North America, with an extension along the Andes into South America. While the Flora of the Russian Empire enumerates 168 species of *Astragalus* (of which I suppose more than nine tenths are bilocellate or nearly so), and only six species of *Phaca*, I recognize in the following paper 66 species of the *Phaca* series to 52 of *Astragalus* proper. Moreover, rather less than half of the latter are completely bilocellate by a dorsal septum, and at least half a dozen, of different groups, have been or might be referred to *Phaca*. *A. aboriginum*, *A. Robinsii*, &c. are retained in the *Astragalus* series, on account of the vanishing rudiment of a dorsal septum; and *A. lotiflorus* chiefly, and *A. microlobus* entirely, because of their close affinity to cognate Astragaline species; while, on the other hand, *A. Cooperi* and *A. Beckwithii*, associated with their natural allies among the *Phacæ*, might technically be about as well placed in the other series.

I cannot avoid the conclusion that *Phaca* must be merged in *Astragalus*. Also, — since in perhaps the majority of the *Phacæ* there is no intrusion nor peculiar tumidity of the seminiferous suture, — that the subtribe *Astragaleæ* of De Candolle has no valid foundation, so that *Astragalus* is merely a genus of the *Galegeæ*.

The combination of *Phaca* with *Astragalus* at once leads us to consider the case of *Oxytropis*. This is a genus founded by De Candolle upon Linnæan species of *Astragalus*, and now pretty numerous in species. It is characterized by having, along with the legume of *Phaca*, carried sometimes to an extreme (that is, with the ventral suture septiferous), a beak-like acumination or cusp at the apex of the carina of the corolla, — whence the generic name. Thus *Oxytropis*, strictly considered, would now appear to rest upon this cusp or tip alone.

This tip, moreover, while sometimes conspicuously prominent, is obsolete or barely perceptible in one or more species of every group the genus comprises. We have in North America only 8 species of *Oxytropis*, all northern or montane; and Europe has about as many; but the Flora of the Russian Empire boasts of sixty-one species. Ought *Oxytropis* to be retained as a genus? On the one hand there is a general congruity of the species in habit; on the other, *O. Lapponica*, with the technical generic character almost obliterated, and others of that group, very closely resemble species of *Astragalus* with which they are geographically associated. Moreover, the technical generic character is of no such value in *Indigofera*.

Probably the best support of the genus, notwithstanding the reduction of *Phaca* to *Astragalus*, has been the constant coincidence of the pointed keel of the corolla with the introflexion of the ventral suture; in other words, that no *Astragali*, in the strict sense, are known with a pointed keel. There are, however, among American species some *Astragali* and *Phacæ* with the keel either considerably attenuated upwards or acutish. And at length we have one from Arizona, described at the end of the genus, under the name of *A. nothoxys*, which, along with the habit and the dorsally bilocellate legume of a true *Astragalus*, has in the corolla a sharply acuminate keel! Still, although *Oxytropis* could hardly be more completely invalidated than by this discovery, I think it probable that it may still be kept up, on the ground of general convenience.

If *Phaca* must needs be merged in *Astragalus*, it is obviously desirable that the change should be made as soon as possible, and the requisite alterations in nomenclature effected. Moreover, our species greatly needed revision, and reduction to some systematic arrangement. In this view, having obtained from their obliging proprietors the important materials in the herbaria of Dr. Torrey, Mr. Durand, and of the Philadelphia Academy (containing the types of most of Nuttall's species), and collated them with those of my own herbarium, I have devoted much time to the study of these plants; and the result is herewith presented.

The general order is from the completely bilocellate legumes, through the imperfectly bilocellate, to the strictly unilocular species; with no attempt (which would be hopeless) to dispose the groups in any natural series. When brought into proper form for a systematic work, the groups themselves would be considerably condensed, reduced, or subordinated.

1. ASTRAGALUS, *Tourn.*

CLAVIS.

I., II. Corollæ carina obtusa. Sp. legitimi, 1 – 108.

III. Corollæ carina acutissime acuminata. Legumen Astragalorum typicorum. Sp. anomala, 109.

I. Legumen sutura dorsali intrusa vel impressa bilocellatum aut subseptatum, sutura ventrali in unilocularibus nullo modo seu minus quam dorsalis intrusa. ASTRAGALUS, L., DC. Sp. 1 – 52.

Legumen septo completo bilocellatum, didymum, locellis 1 – 2-ovulatis. § 8.

Legumen septo completo bilocellatum breve, locellis 3 – 4-ovulatis, estipitatum, Ovato-trigonum, crasso-coriaceum, dorso profundissime sulcatum bipartitum. Flores parvi, albo-violacei : carina corollæ falcato-attenuata. § 7.

Turgido-ovatum, tenui-coriaceum, sulco levi. Flores parvuli, flaviduli. § 3.

Legumen septo completo manifesto bilocellatum, locellis 5 – multi-ovulatis, haud (in sp. no. 14 brevissime) stipitatum.

Crasso-succulentum, exsiccatum parietibus medullosis. § 1.

Membranaceum, vesicario-inflatum, septo versus medium seminifero. § 2.

Coriaceum vel subcartilagineum.

Oblongum, teres, dorso anticeque subsulcatum. Subcaules, villo sericeo molli-ssimo splendentes : flores speciosi. § 4.

Oblongum, teres, nec antice vix postice sulcatum. Elati, glabelli ; flores haud amœni. § 5.

Oblongum, ovatum seu lineare, postice bicarinatum vel profunde sulcatum, sectione transversali obcordata vel e dorso biloba vel Y-formi.

Stipulæ adversus folium pl. m. connatæ. Flores spicati vel capitati, medio-ocres. Legumen oblongum, compresso-trigonum, pubescens seu villosum. § 6.

Stipulæ discretæ.

Flores parvi seu parvuli ; calycis tubo brevi. § 9.

Flores majusculi ; calycis tubo cylindrico. Legumen lineari-elongatum, glaberrimum. § 10.

Legumen septo incompleto seu nullo uniloculare, sub-bilocellatum, vel sutura dorsali ventralem attingente interstinctum quasi bilocellatum,

Stipitatum. § 11, et pro parte § 14.

Estipitatum.

Stipulæ omnes alte folium adversus connate. § 12.

Stipulæ præter inferiores discretæ liberæ.

Legumen 6 – 7-ovulatum floresque (purpurei) minimi. § 13.

Legumen pluri-ovulatum, sat magnum, raro parvulum,

Vix ac ne vix obcompressum : calyx brevis.

Flores albi, violacei, seu purpurei. § 14.

Flores flavidi. Calycis dentes elongati. § 15.

Maturitate obcompressum, suturis approximatis. Calycis dentes tubo sæpissime oblongo vel cylindrico breviores. Plantæ albo-sericeæ vel canescentes : flores violacei seu purpurascens. § 16.

II. Legumen sutura dorsali haud vel minus quam ventralis intrusa seu impressa plane uniloculare. PHACA, L., DC. Sp. 53–108.

1. Pinnatifolii, rarius abortu paucifoliolati seu aphylli, quandoque simplicifolii. Sp. 53–106.

Legumen lanosissimum, coriaceum. Herbæ lanuginosæ. § 17.

Legumen glabrum, inflatum, majusculum, sutura ventrali manifeste intrusa. § 18.

Legumen glabrum vel pubescens (nunquam sub lana longa occultum), sutura neutra intrusa, ventrali nunc intus prominula,

Membranaceum, inflatum, nec compressum,

Vesicarium, magnum seu majusculum, sæpe stipitatum. § 19.

Vesicarium, subglobosum, parvum, haud stipitatum. § 21.

Elongato-cylindricum, stipitatum. § 20.

Coriaceum, antice concavum sutura cariniformi percursum, stipitatum. § 22.

Cartilagineum, breve, teres, haud stipitatum, suturis utrisque crassis extus prominentibus.

Flores subpollicares, albi. Foliola persistentia. § 23.

Flores purpurei leguminaque minimi. § 13, pro parte.

Coriaceum, ovatum, oblongum, raro cylindricum, vix ac ne vix compressum, sæpius estipitatum. § 24: Cf. § 15 (sp. 46).

Crasso-cartilagineum, compressum, exserte stipitatum, incurvum, suturis validis marginatum. § 25.

Coriaceum vel chartaceum, compressum, rectum seu rectiusculum, suturis nerviformibus marginatum. § 26.

2. Quasi palmatim trifoliolati. Legumen conico-ovatum, parvum, calyce subinclusum. § 27.

Species ignotæ ad calcem.

Series I. Legumen sutura dorsali seu inferiori (carinali) intrusa aut subseptatum aut bilocellatum. (In unilocularibus sutura ventralis nequitum aut minus quam dorsalis intus tumida vel induplicata.)
ASTRAGALUS, L., DC.

§ 1. *Sarcocarpi*. Legumen pruniforme succulentum (exsiccatum parietibus crassis medullosis), indehiscens, in calyce haud stipitatum, septo completo bilocellatum. Radix perennis. Caules foliosi humiles. Stipulæ discretæ fere liberæ. Racemi spiciformes breves.

* Ovarium et legumen glaberrima.

1. A. CARYOCARPUS, Ker. Bot. Reg. t. 176; Gray, Pl. Wright. 1, p. 51 (ubi syn.). *A. carnosus*, Nutt. Gen. (non Pursh, nisi fruct.) *A. succulentus*, Richards.; Lindl. Bot. Reg. t. 1324. *A. pachycarpus*, Torr. & Gray, Fl. 1. p. 332. Pube appressa subcinereus; floribus violaceis; legumine globoso vel ovato plerumque apiculato percrasso. —

Saskatchewan to Texas. *A. pachycarpus*, known only from a single specimen, seems to be only a depauperate state of *A. caryocarpus*.

2. *A. MEXICANUS*, A. DC., Pl. Hort. Genev. 5, p. 7, t. 3. *A. trichocalyx*, Nutt. in Torr. & Gray, Fl. 1, p. 332. Viridior, altior, minus pubescens; floribus albis vel ochroleucis apice purpureo seu violaceo pl. m. tinctis; calyce pube molli brevi albo-villoso vel tomentoso; legumine ovato-globoso vix apiculato. — Plains from the Mississippi River at St. Louis to S. Texas and to the base of the Rocky Mountains. — As this has not yet been found even on the Mexican side of the Rio Grande, the older name of *Mexicanus* should perhaps give way to Nuttall's good name of *trichocalyx*. Some of the Texan forms especially, with less hairy calyx, run much too close to the foregoing species; but, on the whole, this pale-flowered and coarser fleshy-fruited *Astragalus* seems to hold distinct.

* * Ovarium cano-hirsutum: legumen vetustate nunc glabratum.

3. *A. PLATTENSIS*, Nutt. in Torr. & Gray, l. c. *A. caryocarpus*, Torr. in Ann. Lyc. N. Y. Laxe villosum; stipulis majusculis; floribus ochroleucis nunc apice purpureo tinctis; legumine ovato acuminato. — Nebraska to Texas.

Var. *TENNESSEENSIS*. *A. Tennesseensis*, Gray in Chapm. S. Flora. *A. Plattensis*, Gray, Man. addend. 1863, p. 91. Legumen oblongum, subcurvatum. — Prairies of Illinois, and Nashville, Tennessee, to N. W. Alabama.

§ 2. *Diphysi*. Legumen ovatum vel globosum, membranaceum, vesicario-inflatum, fere glabrum, estipitatum, suturis utrisque introflexis pl. m. didymum complete bilocellatum; septo versus medium seminifero; loculis polyspermis. — Multicaules e radice perenni, pube brevi vel subnulla; stipulis discretis petiolo subadnatis. Flores parvuli, albi vel cyanei, spicati vel subcapitati.

* Humiles, glabri vel glabelli; racemis capituliformibus densifloris. Legumen vesicario-ovatum, acuminatum.

4. *A. DIPHYSUS*, Gray, Pl. Fendl. p. 34. Subglaber; foliolis 9–11-jugis confertis carnosulis oblongis; calycis tubo cylindraceo dentibus subulatis duplo longiori; legumine glaberrimo acumine incurvo. — New Mexico, and probably in Utah. Flowers blue or purple, occasionally white. Legume half an inch or more in diameter, grooved down both sides.

5. *A. LENTIGINOSUS*, Dougl. in Hook. Fl. Bor. Am. Hirsutulus; foliolis 8–9-jugis obovatis; calycis tubo campanulato dentibus vix longiori; legumine puberulo demum glabro arcuatim incurvo. — Interior of Oregon and Washington Territory. — Flowers known only from specimens collected in Wilkes's Exploring Expedition near Fort Okanagan. They are much smaller than those of the preceding species, only 4 lines long; the corolla apparently white or purplish. Legumes very much like those of *A. diphysus*, but more incurved, and less sulcate down the outer or dorsal side. It is only in Douglas's specimens that they have been found mottled or freckled.

* * *Elatior*, cinereus; spicis laxifloris. Legumen globoso-didymum.

6. *A. FREMONTII*, Torr. & Gray, Bot. Whipl. Exped. (Pacif. R. R. Surv. 4), p. 24 (80), excl. var.! Pilis appressis cinereus; caule ultrapedali parcius folioso; foliolis 5–6-jugis ovalibus obovatisve retusis; floribus in spica laxiuscula subsessilibus "purpureis" (lin. 4 longis) patentibus; calycis dentibus tubo longiuscule campanulato brevioribus; legumine glabro globoso apice brevissimo subincurvo postice paullo antice profunde sulcato didymo. — Banks of the Rio Virgen, in the desert of Nevada, between California and New Mexico, Fremont, who alone has met with it. For the specimens referred to this in Dr. Bigelow's collection are probably different. Legume half an inch in diameter, the apex inconspicuous at maturity, although in the forming fruit there is a broad and more manifest acumination. The two sutures meet and unite in the very middle of the cell.

§ 3. *Chætodontes*. Legumen ovatum, parvum, flore haud longius, estipitatum, coriaceum, turgidum, nunc compressiusculum, postice pl. m. sulcatum, septo completo bilocellatum, locellis 3–4-ovulatis. — E radice perenni multicaules, foliosi, undique villo sericeo albicantes; foliolis angustis sæpius acutis. Flores spicati, parvuli, ut videtur flaviduli, patentes; tubo calycis brevi, dentibus setaceis elongatis corolla parum brevioribus. Stipulæ liberæ, subdiscretæ, subulatæ.

7. *A. CHÆTODON*, Torr. in Bot. Wilkes Expl. Exped. ined. Pedalis; pube villosa; foliolis 10–12-jugis lanceolatis seu oblongo-linearibus (3–6 lin. longis); pedunculis folia superantibus; spica oblonga densa nunc basi interrupta laxiuscula; calyce villosissimo, dentibus tubo longioribus; legumine villoso postice vix sulcato. — Plains on the Kooskooskie River, interior of Washington Territory, Rev. Mr.

Spalding, Dr. Pickering. — Flowers nearly 5 lines long. Bracts setaceous. Legume $2\frac{1}{2}$ or scarcely three lines long, apiculate, under the wool transversely veined, maturing one or two seeds in each cell.

8. *A. LYALLI*, sp. nov. Albo-sericeus; spica brevius pedunculata elongata laxiflora; floribus parvis (lin. 3 longis); calyce villosa, dentibus tubo æquilongis; legumine incano postice profundius sulcato: cæt. præcedentis. — Upper Yakima River, on the boundary between British Columbia and Washington Territory, Dr. Lyall (no. 8, ex herb. Kew.). — Appears different enough from the preceding by the more silky pubescence, and the loosely-spiked flowers of only half the size.

§ 4. *Mollissimi*.* Legumen cartilagineum vel coriaceum, estipitatum, oblongum, turgidum, nec compressum nec obcompressum, ad suturas utrasque pl. m. sulcatum, septo perfecto bilocellatum, demum incurvum. — E caudice perenni subacaules, villo sericeo molli (sæpius fulvo vel aurato) splendentes; pedunculis scapiformibus elongatis. Spicæ densifloræ. Flores inter majores, violacei; calyce tubuloso.

9. *A. MOLLISSIMUS*. Torr. in Ann. Lyc. N. Y. 2, p. 178. Legumen angusto-oblongum, cartilagineum (5–9 lin. longum), glaberrimum, su-

* The materials in our herbaria are too scanty to justify me in meddling with the *Astragali* of the region contiguous to the United States on the south. But there are two very well-marked Mexican species which may be noticed here, viz. *Phaca mollis*, H.B.K., and a new species allied to it. If not referable to the present group, — with some extension of the character as to the legume, making less account of the introflexion of the dorsal suture, — they will constitute a strictly analogous group. The species are: —

A. HUMBOLDTII. *Phaca mollis*, H.B.K. Nov. Gen. & Sp. 6, p. 496, t. 585. Brevicaulis, fulvo-sericeus; foliis oblongis (lin. 4–6 longis); spicis oblongis; floribus mediocribus (lin. 8–9 longis) “albis seu violaceis” (ex Kunth); vexillo superne recurvo-patente; alis angustis rectis carinam subfalcatam longius superantibus; ovario sericeo suturis haud introflexis. — The specimens examined were collected near the city of Mexico, by Dr. Halstead (herb. Torr.), in flower. The legume is still unknown. Instead of the “alæ . . . nec adherentia” of Kunth, I find that the wing and keel petals on each side hook into each other neatly, as in other species.

A. ORTHANTHUS, sp. nov. Brevicaulis, velutino-tomentosus; foliis ovalibus (6–8 lin. longis); spicis capitaliformibus; floribus elongatis (ultrapollicaribus); corolla ut videtur rubro-purpurea recta, vexillo spathulato duplicato, alis lanceolatis carina haud incurva parum longioribus; legumine ovato tumido obcompressa coriaceo velutino sutura dorsali septifera fere bilocellato. — Mexico, near Perote, on sandy hillsides, Dr. Halstead, in herb. Torr. — Leaves and peduncles about 9 inches long. Immature legumes nearly an inch in length. The shape of the flower, with its narrow and strict petals, is remarkable.

turis utrisque sulcatis subdidymum. Ovarium etiam glaberrimum. — Plains of Nebraska to the western borders of Texas.

10. A. BIGELOVII, Gray, Pl. Wright. 2, p. 42. Legumen coriaceum, magis turgidum, ovali-oblongum (semipollicare), dense lanosum, suturis parum sulcatis. — Western borders of Texas, New Mexico, and near Chihuahua. — Nearly resembles the foregoing, except in the ovary and the legume.

§ 5. *Uliginosi*. Legumen coriaceum, turgidum, oblongum, teres, nec antice vix postice sulcatum, septo perfecto bilocellatum, fere rectum, estipitatum. — E radice perenni elati (sesqui-tripedaes), pube adpressa subcinerei vel glabrati. Spicæ densifloræ. Flores viridulo-albidi vel ochroleuci, nunc purpureo lurido tincti, per anthesin patentissimi seu deflexi, sed legumina (semipollicaria) in spicam confertam arrecta. Stipulæ a petiolo liberæ, nunc discretæ, nunc in eadem stirpe adversus folium coadunatæ.

[A. ULIGINOSUS, L. Bracteis ovato-lanceolatis longe acuminatis calycem superantibus, et legumine postice longitudinaliter impresso (vix canaliculato) a *Canadensi* differt. — This Eastern Siberian species was recognized by Pallas as a form or analogue of the following.]

11. A. CANADENSIS, (Tourn.) L. *A. Carolinianus*, L. *A. orthocarpus*, Dougl. in herb. Hort. Soc. Elatus; bracteis subulatis calyce brevioribus; ovario glaberrimo; leguminis sutura dorsali haud impressa, ventrali prominente costæformi. — Canada and Saskatchewan to Louisiana and the interior of Oregon. Occurs with short and also with longer and slender calyx-teeth, the former chiefly eastward.

12. A. MORTONI, Nutt. in Jour. Acad. Philad. 7, p. 19. *A. spicatus* & (ex char.) *A. tristis*, Nutt. in Torr. & Gray, Fl. Minus altus; bracteis ovatis vel lanceolatis calyce brevioribus; ovario pubescente; legumine (*A. spicati*, Nutt.), pube tenui excepto, *A. Canadensi* similimo. — Rocky Mountains, Wyeth, Nuttall. Of *A. Mortoni* we have in herbaria only one or two incomplete flowering specimens; of *A. spicatus* a fruiting specimen, apparently of the same species. Except for the cinereous-pubescent ovary and legume I should refer them probably to *A. Canadensis*.

§ 6. *Onobrychides*. Legumen coriaceum, oblongum seu ovatum, rectum, sæpius pl. m. compresso- vel obcompresso-trigonum, semper postice sulcatum vel exaratum (sectione transversali obcordata vel e dorso biloba), sutura intrusa bilocellatum, pubescens, locellis

pluriovulatis. — Caulescentes e radice perenni, cinereo-pilosuli vel glabelli, adsurgentes vel decumbentes. Stipulæ adversus folium pl. m. coadunatæ. Spicæ seu capitula densifloræ. Flores medio-cres, sæpissime violacei seu purpureæ, semper leguminaque adscendentes vel arrecti.

13. *A. ADSURGENS*, Pall. Astrag. t. 31. *A. Laxmanni*, Jacq. Hort. Vind. 3, t. 37; Pall. Astrag. t. 30: forma pallidiflora. *A. striatus*, Nutt. in Torr. & Gray, Fl. 1, p. 330. Spithamæus ad sesquipedalem, pube adpressa minuta subcinereus, vel glabratus viridis; caulibus subvalidis; stipulis scariosis basi plerumque concretis; spica demum oblonga vel cylindracea; leguminibus ovato-oblongis haud stipitatis, pube brevi adpressa. — Plains of Nebraska to the interior of Oregon and throughout the Saskatchewan region. (Also Siberia.) The Russian botanists recognize a white-haired as well as dark-haired calyx in *A. adsurgens*. A white-haired form, with a rather shorter calyx-tube, a very dense spike, and more nearly erect and rigid stems, which abounds on the plains of Nebraska, is Hooker's var. *robustior* (*A. nitidus*, Dougl. ined.), and is *A. striatus*, Nutt., or rather Nuttall's specimens are intermediate between this and the laxer form, with longer and partly dark-haired calyx: this particularly well accords with Pallas's original figure and description.

14. *A. HYPOGLOTTIS*, L.; DC. Astrag. t. 14. *A. arenarius*, Pall. Astrag. t. 34. *A. dasyglottis*, Fisch. *A. goniatus*, Nutt. in Torr. & Gray, Fl. Humilis, gracilior, diffuso-procumbens, pube laxiore; stipulis subfoliaceis concretis; capitulo plurifloro; leguminibus ovato-trigonis albo-villosis brevissime stipitatis oligo-(2-8-)spermis. — Upper plains of Nebraska, Rocky Mountains, and northward. (Siberia, Europe.)

§ 7. *Reflexi*. Legumen crasso-coriaceum, estipitatum, ovato-trigonum, postice profundissime sulcatum (sulco angusto marginibus rugulosis), bilocellatum, sectione transversali obcordato-biloba, locellis 3-4-ovulatis. Carina corollæ falcata, sursum attenuata, vexillum angustum subæquans, alas sublonge superans! — Caules graciles e radice annua, piloso-pubescentes; foliolis emarginatis. Flores parvi, brevissime pedicellati, pauciusculi, subcapitati, albo-violacei, patentes: legumina deflexa.

15. *A. REFLEXUS*, Torr. & Gray, Fl. 1, p. 334. — Texas. Known only from Drummond's specimens, Buckley's *A. Brazoensis*, which I had too hastily referred here, being different. Flowers scarcely 3 lines

long. Legumes 4 lines long, glabrous, the pericarp thickened on the back each side of the deep groove.

§ 8. *Didymocarpus*. Legumen tenuiter coriaceum, obcompresso-didymum, transversim costato-rugosum vel reticulatum, septo angusto bilocellatum, maturitate in cocca dua intus rima hiascentia mono-disperma (nunquam ultra biovulata) secedentia. Ovarium breviter stipitatum. — Caulescentes e radice annua, parvuli, parce pubescentes; stipulis discretis fere liberis; foliolis emarginatis. Spicæ breves densifloræ. Flores parvi, violacei, nunc fere albi, carina apice arcte inflexa. Legumina sæpissime deflexa.

16. *A. DIDYMOCARPUS*, Hook. & Arn. Bot. Beech. p. 334, t. 81. *A. Catalinensis* & *A. nigrescens* (§ *Microlobium*), Nutt. Pl. Gamb., in Jour. Acad. Philad. n. ser. 1, p. 152. Triuncialis ad pedalem; floribus sessilibus in capitulo vel spica demum cylindracea; legumine didymo parvo valde rugoso (cinereo-hirsutulo scabro vel demum glabro) in calyce brevissime stipitato, locellis uni-ovulatis semine solitario fere repletis. — California. Occurs under a variety of forms, of which Dr. Brewer, of the Geological Survey of that State, has recently collected an instructive series. Ovary truly stipitate; but the stipe of the legume is very short and occult.

17. *A. BRAZOENSIS*, Buckley in Proceed. Acad. Philad. Dec. 1861, p. 452. Annuus? spithamæus; floribus brevissime pedicellatis laxiusculis; legumine maturo valde obcompresso fere scutelliformi incurvo glabro transversim nervoso versus margines reticulato, stipite e calyce exserto, locellis biovulatis plerumque monospermis. — W. Texas, Buckley. Valley of the Nueces, Major G. H. Thomas, in herb. Torr. — In a notice of Mr. Buckley's Texan plants, contributed to the Proceedings of the Philadelphia Academy, April, 1862, I wrongly referred Mr. Buckley's very imperfect specimens of this plant to the little known *A. reflexus*, Torr. & Gray. But the good specimens, with mature fruit, which I now find in Dr. Torrey's herbarium, collected by Major Thomas, show that the species is wholly distinct, and is really allied to *A. didymocarpus*, as its propounder supposed. The disciform and somewhat acetabuliform legume is a quarter of an inch in diameter; its stipe about the length of the calyx.

§ 9. *Micranthi*. Legumen coriaceum, oblongum, lanceolatum, seu lineare, rectum vel curvatum, haud stipitatum, postice sulcatum, sutura dorsali intrusa ventralem extus prominulam attingente bi-

locellatum, locellis multiovulatis. — Caulescentes, humiles vel graciles e radice plerumque annua. Stipulæ discretæ fere liberæ. Flores parvi seu parvuli, violacea seu albida, carina apice incurva vel obtusissima; calycis tubo brevi. (Species inter se diversæ.)

- * Flores numerosi, dense spicati, per anthesin leguminaque deflexi: pedunculi elongati. Pedales et ultrapedales, strigoso-puberuli.

18. *A. VACCARUM*, Gray, Pl. Wright. 2, p. 43. Cinereo-puberulus; radice perenni; calycis dentibus tubo æquilongis; corolla incurva (alba seu albida nunc post anthesin purpurea); leguminibus lanceolato-oblongis arcuatis hirsutulis, sectione transversali late obcordata. — Arizona.

19. *A. HARTWEGI*, Benth. Pl. Hartw. p. 10; Torr. Bot. Mex. Bound. p. 56. Viridior; calycis dentibus tubo brevioribus; corolla fere recta. — Arizona and Mexico. — Legume unknown, but from the enlarging ovary apparently like that of *A. vaccarum*, which may pass into this.

- * * Flores pauciusculi in racemo laxo, per anthesin leguminaque penduli. Humiles, glabelli.

20. *A. COBRENSIS*, Gray, Pl. Wright. p. 43. Diffusus; foliolis retusis; pedicellis tubo calycis vix brevioribus; corolla purpurascens; leguminibus obcompressis oblongis rectis dorso late concavis sub-cymbæformibus. — New Mexico. Ovary short-stipitate, but the legume sessile in the calyx.

- * * * Flores pauci capitati, cum leguminibus oblongis erecti. Corolla dentes calycis tubo multo longiores subulato-lineares haud superans. Humiles e radice annua, villosa-hirsuti.

21. *A. WRIGHTII*, Gray, Pl. Lindh. 2, p. 176, & Pl. Wright. 1, p. 51. Legumen rectum, subcompressum, bicarinatum, acutum, calyce dimidio longius; stylo perbrevis. — Texas. — Very unlike any other of our species.

- * * * * Flores pauci subcapitati, nunc subsolitarii, parvuli, carina vexillo valde breviori apice inflexa paullo producta. Legumen lineare, subcompressum, dorso bicarinatum. Humiles e radice annua, diffusi; foliolis plerumque retusis.

22. *A. NUTTALLIANUS*, DC. Prodr. 2, p. 289. *A. micranthus*, Nutt., non Desv. Glabellus vel cinereo-pubescent; leguminibus juxta basin sursum incurvatis reticulatis aut glabris aut (var. *trichocarpus*,

etc.) cinereo-hirsutulis. — Arkansas and Texas to Arizona. Flowers varying from violet-purple to whitish.

23. *A. LEPTOCARPUS*, Torr. & Gray, Fl. 1, p. 334. Subglaber; leguminibus rectis patentibus minus reticulatis glabris. — Arkansas and Texas. — Corolla 4 or 5 lines long, curved, violet or violet-tipped, the keel produced into a narrower apex. Legume an inch long, thin-walled.

§ 10. *Succumbentes*. Legumen chartaceo-coriaceum, haud stipitatum, lineari-elongatum, valde compressum, sursum falcatum, dorso bicarinatum sulco profundo, sutura intrusa ventralem extus prominulam acutam attingente bilocellatum, sectione transversali Y-formi. — Caules humiles, diffusi, flexuosi; pedunculis brevibus; stipulis discretis liberis. Flores majusculi, laxiuscule subcapitati, purpurascens; calyce cylindrico.

24. *A. SUCCUMBENS*, Dougl. in Hook. Fl. Bor.-Am. 1, p. 151. Cinereo-hirsutus; foliolis obovatis; leguminibus arrectis nitidis eximie reticulatis rete transversa. — Interior of Oregon, on barren grounds of the Columbia and Wallawallah. — Flowers narrow, three fourths of an inch long. Legumes from one to two inches long.

§ 11. *Galegiformes*. Legumen stipitatum e calyce exsertum, cum flore pendulum, coriaceo- vel cartilagineo-chartaceum, rectum, pl. m. trigonum, in nostris angustum, postice maxime sulcatum, sutura dorsali intrusa semi- vel fere bilocellatum. — Caules foliosissimi, e radice perenni erecti, validi, sulcati; stipulis discretis liberis. Racemi elongati confertiflori. Flores majusculi, albi vel ochroleuci (carina tantum purpureo tincta).

* Calyx basi vix gibbosus, nigricanti-pilosus.

25. *A. DRUMMONDII*, Dougl. in Hook. Fl. Bor.-Am. 1, p. 153, t. 57. Molliter villosus, albiflorus; calycis dentibus subulatis tubo brevioribus; legumine glaberrimo lineari-elongato tereti-biventricoso, sulco angusto profundissimo, sectione transversali obcordato-biloba, stipite calycis dentes superante. — Saskatchewan or Hudson's Bay to Nebraska and the Rocky Mountains. — Legume completely or incompletely divided by the intrusion of the dorsal suture.

* * Calyx basi valde gibbosus.

26. *A. RACEMOSUS*, Pursh, Fl. 2, p. 740. *A. galegoides*, Nutt. Gen. Appresse pubescens, glabratus, albiflorus; calycis albido-puberuli dentibus setaceis tubo paullo brevioribus stipitem adæquantibus; legumine glaberrimo lanceolato-oblongo triquetro. — Plains of Nebraska

and Idaho to the Rocky Mountains. — Legume not divided internally into two cells, but the cross section somewhat equally triradiate or Y-shaped.

27. *A. CYRTOIDES*, sp. nov. Molliter pubescens; stipulis parvis; foliolis 7–10-jugis lineari-oblongis supra glabris; pedunculis folia longe superantibus; racemo spiciformi; floribus in pedicello brevi suberecto resupinato-pendulis; calycis tomentulosi dentibus subulatis tubo oblongo 3–4-plo brevioribus; corolla ut videtur ochroleuca calyce vix duplo longiore; ovario stipitato lineari cinereo-pubescente. — Clear Water River, interior of Oregon (now in Washington Territory), in rich land on hillsides, April 14, Rev. Mr. Spalding. — This we have long had in the herbarium; but the legume is still unknown. Its near relationship to *A. racemosus* is manifest. Its calyx is still more gibbous at the insertion and bossed on the upper side, like that of a *Cuphea*. Corolla from half to two thirds of an inch long, less exerted from the calyx than in allied species.

§ 12. *Ocreati*. Legumen estipitatum, coriaceum, obcompressum vel obcompresso-trigonum, sutura dorsali impressa ventrali approximata pl. m. interstinctum, haud bilocellatum. Humiles vel humifusi e radice perenni, pilis incumbentibus canescentes vel strigosi. Stipulæ a petiolo liberæ, inter se adversus folium alte connatæ. Flores spicati, vix mediocres; calycis tubo sæpius campanulato.

* Flores saturate flavi. Stipulæ in ocream obliquam petioli basin caulemque vaginantem coalitæ.

28. *A. FLAVUS*, Nutt. in Torr. & Gray, Fl. 1, p. 335. Multicaulis, diffusus, pube tenui canescens; foliolis linearibus subacutis; legumine parvo (4 lin. longo) calyce semi-incluso canescente ovato recto utrinsecus impresso, loculo suturis approximatis longitudinaliter stragulato. — Rocky Mountains, about lat. 41°; found only by Nuttall.

* * Flores purpurei, patentes. Stipulæ vix vaginantes.

29. *A. HUMISTRATUS*, Gray, Pl. Wright. 2, p. 43. Strigoso-pilosus, subglabratus; caulibus plurimis e radice perenni procumbentibus elongandis; foliolis lanceolatis seu lineari-oblongis acutis; calycis dentibus tubo longioribus; vexillo albo-purpureo et lineato; carina apice angustato producto inflexa; legumine oblongo-lineari arcuato pubescente obcompresso-trigono, sutura dorsali intrusa ventralem extus prominentem carinatum haud attingente. — New Mexico and Arizona.

* * * Flores majusculi ochroleuci? Stipulæ vix vaginantes.

30. *A. OREGANUS*, Nutt. l. c. Nanus, hirsutulo-canescens; foliolis obovatis emarginatis; floribus in pedunculo brevi spicato-capitato; calyce cylindraceo tubo dentibus bis longiori; ovario fere semi-bilocellato. — Western slope of the Rocky Mountains, collected only by Nuttall, without fruit. Arranged among ochroleucous species in the Flora of North America; but the color of the corolla is not recorded, nor can it be determined from the only specimen I have seen, that in herb. Torrey. The stipules, at least the lower ones, are connate almost to the top.

§ 13. *Microlobi*. Legumen minimum (lin. 2–3 longum), estipitatum, coriaceum seu cartilagineum, 6–7-ovulatum, elliptico-ovatum, aut fere teres postice vix complanatum, aut postice late concavum, semper uniloculare, sutura neutra introflexa, ventrali costiformi crassa extus prominente. — Subcineri: caules erecti vel adscendentes e radice perenni, graciles, rigiduli; foliolis 5–8-jugis linearibus. Stipulæ inferiores subconnatæ, cæteræ discretæ. Racemi spiciformes, multiflori, virgati. Flores parvi, purpurei, per anthesin recurvo-patentes; calyce brevi, dentibus abbreviatis.

Here are two closely allied species which have been confounded, and indeed are not readily distinguished without the fruit; one of which, by the strong concavity of the dorsal face of the legume, would be looked for in *Astragalus proper*, while the other, wanting this concavity, is referable to *Phaca*, where it would be sought among the *Scytocarp*i.

31. *A. GRACILIS*, Nutt. in Fras. Cat., & Gen. 2, p. 100. *A. parvifolius*, Nutt. in herb. Acad. Philad. *Dalea parviflora*, Pursh, Fl. 2, p. 474. Caulibus virgatis (ultrapedalibus e radice prælonga dulci); foliolis angustissime linearibus fere filiformibus obtusis retusisve (lin. 7–10 longis); racemis longe pedunculatis elongatis densifloris; floribus pallide purpureis albidisve (lin. 3 longis); leguminibus patentibus coriaceis dorso impresso quasi cymbiformibus canescenti-pilosis demum glabellis transversim rugoso-venosis, sutura ventrali subcuta. — Plains of Nebraska and Missouri to the Rocky Mountains. — This and the following species may have been confounded from the first. Except as to the fruit, Nuttall's original description would as well or better apply to *A. microlobus*; but the original specimens preserved are of the plant here retained as *A. gracilis*. From his tickets it appears that he more recently noticed that there were two species; but the fruit of the second species, which confirms the distinc-

tion, was first brought to light in Hall and Harbour's recent collection, no. 119.

32. *A. MICROLOBUS*. *A. gracilis*, Torr. in Ann. Lyc. New York, 2, p. 179; Nutt. in herb. Acad. & herb. Torr. 1838; Gray in coll. Parry, no. 189, & coll. Hall & Harbour, no. 119. Caulibus subpedalibus diffusis; foliolis linearibus seu oblongo-linearibus emarginatis (lin. 4–6 longis); racemis breviusculis sæpius laxifloris; floribus saturate purpureis (lin. 4 longis); leguminibus reflexis crasso-cartilagineis puberulis tenuiter rugulosis turgidis, dorso tantum planiusculo, sutura ventrali percrasso. — Plains of Nebraska, &c., to the Rocky Mountains. — By the above characters flowering specimens of this may be distinguished from the original *A. gracilis*; and the species is confirmed by the legume, which is that of a *Phaca*, and in texture, &c. is much like that of *A. pectinatus* on a very reduced scale.

§ 14. *Oroboidei*. Legumen stipitatum vel estipitatum, coriaceum vel fere membranaceum, vix aut ne vix obcompressum, sutura dorsali nunc paullulum nunc profundius impressa vel introflexa plane uniloculare vel imperfecte bilocellatum. — Caulescentes, glabelli vel pubescentes, graciles. Stipulæ præter infimas discretæ, fere liberæ. Racemi sæpe spiciformes breves, vel capitula pauciflora. Flores parvuli vel mediocres, albo-violacei, purpurei seu albi, patentes; calyce brevi.

* *Veri, Boreales*, e radice perenni adscendentes; floribus pedicellatis plerumque racemosis. Legumina oblonga, stipitata (in *A. Oroboide* et *sparsiflora* stipite brevissimo occulto), subsecunda, sæpius pendula, sutura ventrali extus prominula.

+ Legumen membranaceum, glabrum vel tenuiter puberulum, lateraliter compressiusculum, septo e sutura dorsali rudментарio angustissimo uniloculare, ventre gibbosum, nempe sutura dorsali recta vel concaviuscula, ventrali arcuata.

++ Legumen longe stipitatum, dorso nequaquam sulcatum, sectione transversali ovali. Foliola nunquam retusa, infima stipulis approximata, nisi foliorum inferiorum. Flores in racemo compacto, albi vel cærulescentes, carina violacea.

33. *A. ABORIGINUM*, Richards. in App. Frankl. Journ. ed. 2, sub nom. falso "*aboriginorum*." *Phaca aboriginorum*, Hook. Fl. Bor.-Am. 1, p. 143, t. 56. Canescenti-puberulus seu villosulus; caulibus adscendentibus pedalibus rigidis; foliolis 3–6-jugis linearibus seu oblongo-

lanceolatis; calycis dentibus filiformi-subulatis tubo parum brevioribus; leguminibus semi-ellipticis mox glabris, stipite calycem bis excedente. — Lake Winipeg to Bear Lake and the Rocky Mountains. — The legume is correctly described by Hooker as “sutura hinc plana marginibus paululum introflexis, illinc curvata”; but in the plate the straight suture is represented as the seminiferous one. Hence the erroneous description in this respect in the Flora of North America.

34. *A. GLABRIUSCULUS*, Gray, Enum. Pl. Parry, Hall & Harbour, no. 116, in Proceed. Acad. Philad. March, 1863. *Phaca glabriuscula*, Hook. l. c. Glaber, vel pilis brevibus raris conspersus; foliolis tenuioribus viridibus “lineari-lanceolatis subacutis” seu oblongis utrinque obtusis; ovario glaberrimo; leguminibus lanceolato-subfalcatis in stipitem calyce bis terve longiorem attenuatis: cæt. fere præcedentis. — Valleys in the Rocky Mountains in British America, Drummond. Also, var. *major*, near lat. 40°, at middle elevation, Hall and Harbour; with foliage resembling large forms of *A. alpinus*. Legume an inch, stipe nearly half an inch long.

++ ++ Legumen brevi-stipitatum, dorso haud vel obsoletissime sulcatum, sectione transversali obovata retusa, pube minuta subnigricante. Foliola subretusa. Flores albi, parvuli (lin. 4. longi).

35. *A. ROBBINSII*, Gray, Man. Bot. N. U. S. ed. 2, p. 98. *Phaca Robbinsii*, Oakes in Hovey, Mag. Hort. 7, p. 181. Subglaber; caulibus pedalibus suberectis; foliolis 3–5-jugis ovalibus oblongisve; racemo compacto oblongo; dentibus calycis tubo multo brevioribus; leguminibus tenuiter membranaceis oblongis rectis vel subincurvis parvulis (semipollicaribus) obtusissimis basi in stipitem e calyce haud exsertum subito angustatis. — Near Burlington, Vermont, in fissures of limestone banks of the Onion or Winooski River; the only known habitat, discovered by Dr. Robbins. In this, as in the two preceding species, the dorsal suture is not itself introflexed, but bears the rudiment of a septum in the form of a narrow and thin membrane projecting distinctly, but a very little way, into the cell. The present is a connecting link between the foregoing and the following species.

+ + Legumen magis coriaceum, nigro-rariusve cinereo-pubescent, sutura dorsali sulcato-impressa pl. m. trigonum et semi-bilocellatum, —

++ Subsymmetricum, breve, lentiformi-oblongum, compressiusculum, sectione transversali obcordata, sutura ventrali paullo magis gibbosa.

36. A. OROBOIDES, Hornem. Fl. Dan. t. 1396. *A. leontinus*, Wahl. Fl. Lapp. t. 12, f. 4. *A. alpinus giganteus*, Pall. Astrag. t. 33. *A. brachytropis*, C. A. Meyer. *Phaca brachytropis* (Stev.) & *oroboides*, DC. *P. parviflora*, Nutt. in Torr. & Gray, Fl. Glabellus; caulibus suberectis sub-sesquipedalibus; foliolis 5-7-jugis oblongis ovalibusque vix retusis; racemo elongato secundo; floribus violaceis aut purpureis (lin. 5-6-longis), alis carinam superantibus; legumine elliptico-lentiformi semipollicari sæpissime nigro-villoso calyce triplo longiore dorso modice sulcato subsemibilocellato oligospermo, stipite brevissime occulto. — Arctic and North Alpine Europe and Asia.

Var. AMERICANUS. *Phaca elegans*, Hook. l. c. Minus viridis, pube tenui subcinereus; foliolis sæpe lineari-oblongis; floribus semper minoribus (lin. 3-4 longis); legumine calycem 3-4-plo superante minus nigricante pube appressa sæpius griseo. — Rocky Mountains, in and considerably below the Alpine region, Drummond, Parry and Hall. Saskatchewan, Bourgeau. Labrador, Elsner, communicated by the late Dr. Steetz. — Legume 5 to 6 lines long.

++ ++ Legumen dorso magis impresso trigonum, sectione transversali profunde obcordata, rectiusculum vel incurvum, dorso gibbosum, nempe sutura dorsali longiori convexa, ventrali recta seu concava. Foliola nunc retusa vel subemarginata.

37. A. ALPINUS, L.; Pall. Astral. t. 32. *A. secundus*, Michx. ! *A. Labradoricus* & *Phaca astragalina*, DC. Piloso-pubescent seu glabellus; caulibus diffusis; foliolis 6-12-jugis ovalibus seu oblongis; racemo brevi vel subcapitato plurifloro; floribus violaceis seu albo-violaceis (lin. 5-6 longis), alis carinam majusculam raro vel paullo superantibus; legumine oblongo recto vel subcurvato nigro-villoso seu nigro-pubescente trigono-turgido sutura profunde intrusa semi- vel subbilocellato, stipite calycem sæpius excedente. — Arctic and Alpine regions around the Northern hemisphere. Not found on the higher mountains of the Eastern United States, but occurring at moderate elevations in the northern parts of Vermont and Maine, and even on the coast of Maine.

38. A. SPARSIFLORUS. Gray in Enum. coll. Parry, Hall, & Harbour, l. c. no. 128, 129, sine char. Appresse pilosulus, glabratus; caulibus gracillimis ramosis diffusis; stipulis triangulari-subulatis discretis; foliolis 4-6-jugis obovatis vel suborbiculatis sæpe emarginatis parvis (2-3 lin. longis); pedunculis folio vix longioribus 3-5-floris; floribus

albis violaceo tinctis parvis (lin. 3 longis), vexillo apice emarginato-bifido alisque carinam incurvum longe superantibus; calycis dentibus tubo æquilongis; ovario 8-10-ovulato breviter stipitato; legumine parvo oblongo falcato-incurvo striguloso-pubescente substipitato oligospermo sutura dorsali intrusa semibilocellato. — On the lower Rocky Mountains of Colorado Territory, about lat. 40°, Hall and Harbour, no. 128. — Stems a foot or more in length, with many slender branches. Legumes 3 to 4 lines long, coriaceous, spotted with purplish, either slightly or strongly incurved, pointed with the style, pubescent with whitish short hairs, ripening from three to five seeds; the stipe as short and occult as in *A. oroboides*; the dorsal suture as deeply sulcate-impressed as in that species; the ventral suture acute and prominent.

Var. **MAJUSCULUS**. Glabrior; foliolis majoribus (lin. 3-5) obovato-oblongis; pedunculis 5-10-floris in racemo laxo secundo; legumine magis elongato semipollicari 10-12-spermo. — With the preceding (no. 129 of the same collection); the legumes the same, except in their greater length, similarly spotted.

* * *Californici*, pusilli, e radice annua erecti; foliolis obcordato-emarginatis; floribus paucis capitatis. Corollæ alæ et præcipue vexillum carinam longe superantes. Ovaria sericeo-canescencia breviter stipitata vel sessilia. Legumina matura ignota.

39. A. TENER, sp. nov. *Phaca astragalina* β. Hook. & Arn. Bot. Beech. p. 334. *A. Hypoglottis*, var. *strigosa*, Kellogg in Proceed. Calif. Acad. 2, p. 115, fig. 373. Spithamæus, pilis nigris albidisque brevissimis strigosus; stipulis parvis ovatis scariosis; foliolis 5-7-jugis lineari-cuneatis late emarginatis; ovario lineari semibilocellato 10-12-ovulato stipitato, deflorato reflexo. — California, Douglas: from near Monterey or San Francisco. — This was long ago collected by Douglas, without fruit. But the forming legume is deflexed, linear-lanceolate, canescent, and on a stipe considerably shorter than the tube of the calyx. The latter is black-hairy and in other respects much like that of *A. alpinus*. But the corolla is wholly different, much narrower, with the far smaller keel one third shorter than the wings, and only half the length of the standard; the color apparently similar, the keel tipped with deep violet. The root is evidently annual. If this is, as I suppose, the plant coarsely figured by Dr. Kellogg, the legumes are oblong-linear, somewhat incurved, not obviously stipitate, and only spreading.

40. *A. BREWERI*, sp. nov., Gray in Proceed. Acad. Calif. ined. Subspithamæus; foliolis 4–5-jugis oblongo-obcordatis; capitulo 5–7-floro compactiore; legumine immaturo globoso-ovato cano-sericeo in calyce haud stipitato erecto 6-ovulato uniloculari, sutura dorsali leviter intrusa; cæt. præcedentis. — California, “in the Sonoma valley, common in fields: April 18.” Dr. W. H. Brewer, California Geological Survey. — Closely resembling the foregoing in its whole appearance; but perhaps more branched from the annual root, and with broader leaflets. Calyx and corolla similar; the latter tinged with violet-purple, and the summit of the keel deep violet. But even the ovary is sessile and ovate, and the half-grown legumes (which are very white-hairy and only twice the length of the calyx) are erect, and in a close head.

* * * *Austro-Orientales*; racemis spiciformibus sæpissime brevibus; calyce nunquam nigro-piloso. Legumina glaberrima, reticulata, haud vixve stipitata, oblonga, pl. m. incurva.

+ E radice annua multicaulis, diffusus.

41. *A. LINDHEIMERI*, Engelm. in Gray, Pl. Wright. 1, p. 52. Glabellus; foliolis 6–8-jugis angusto-oblongis plerumque emarginatis; racemo subcapitato; calycis dentibus subulato-setaceis tubo subduplo longioribus; corolla violacea; carina majuscula alis et vexillo amplo vix emarginato paullo brevior; leguminibus in pedicello patente adsurgentibus oblongo-linearibus subfalcatis compressis transversim venuloso-reticulatis dorso bicarinatis sutura intrusa semibilocellatis, sutura ventrali costiformi acuta. — Texas. — Corolla half an inch long, showy. Legume an inch or more in length, substipitate, the ovary manifestly short-stipitate.

+ + E radice perenni.

42. *A. DISTORTUS*, Torr. & Gray, Fl. 1, p. 332. Multicaulis, humilis, diffusus, subglaber; foliolis 8–12-jugis oblongis emarginatis; floribus breviter spicatis; calycis dentibus lato-subulatis tubo (nigrescenti-puberulo) dimidio brevioribus; corolla pallide purpurea, vexillo alte emarginato; leguminibus ovato-seu lanceolato-oblongis arcuatis crassocoriaceis minutim reticulatis subteretibus ad suturas præsertim dorsali sulcatis unilocularibus. — Texas, Arkansas, and S. Illinois (Dr. Mead). — Corolla narrow and small, scarcely over four lines long. Legumes variable in thickness, delicately reticulated when mature, 6 to 9 lines long, obscurely obcompressed; the ventral suture a little, but the dorsal more conspicuously introflexed.

43. *A. OBCORDATUS*, Ell. Sk. 2, p. 227. Multicaulis, humilis, diffusus, subglaber; foliolis 7–12-jugis obcordatis; racemo brevi spiciformi; calycis cinereo-pilosi dentibus setaceo-subulatis tubo æquilongis; corolla pallide purpurea, vexillo emarginato; leguminibus lunatis subcompressis tenuiter coriaceis maxime reticulatis, sutura dorsali extus sulcata intra loculum leviter intrusa, ventrali acuta costiformi. — Florida and Georgia, in sand-barrens. — Flowers scarcely larger than in the foregoing; the crescent-shaped legumes larger, fully an inch long, the ventral suture salient.

44. *A. GLABER*, Michx. Fl. 2, p. 66. Elatus (bipedalis), erectus; foliolis 9–18-jugis elliptico- seu lineari-oblongis crassiusculis vix retusis; stipulis minimis; racemo laxifloro; calycis dentibus triangulari-subulatis brevibus; corolla alba, carina alis vexilloque paullo brevior; leguminibus oblongo-linearibus arcuatis seu rectiusculis subcompressis transversim venoso-reticulatis dorso sulcatis et sutura introflexa semibilocellatis, sutura ventrali extus prominente costiformi. — North Carolina to Florida, in pine-barrens. — Flowers fully half an inch, legumes an inch long.

§ 15. *Lotiflori*. Orobideis Austro-Orientalibus subdiv. + + fere similes, nisi plantæ et legumina villosæ seu canescentes, humiliores, floribus flavidis. Legumen semi-ovatum oblongumve, turgidum, coriaceum, subarcuatum, dorso gibboso pl. m. impresso subtrigonum, uniloculare, sutura ventrali extus carinato-prominente. Corolla calycem paullo superans, carina apice inflexa. Calycis dentibus elongatis tubo longioribus.

45. *A. VILLOSUS*, Michx. Fl. 2, p. 67. *Phaca villosa*, Nutt. etc. Laxe villosus; caulibus spithamæis adsurgentibus; foliolis ovalibus retusis; racemis longe pedunculatis capituliformibus plurifloris; calycis dentibus lineari-subulatis tubo multum longioribus; legumine villosissimo dorso manifeste intruso fere semidiviso, sectione transversali obcordata. — Dry pine barrens, South Carolina to Florida and Louisiana. — Corolla 4 lines long, curved.

46. *A. LOTIFLORUS*, Hook. Fl. Bor.-Am. l. c. *Phaca lotiflora*, Nutt.; Torr. & Gray, l. c. *P. (Astragalus) cretacea*, Buckley in Proceed. Acad. Philad. Dec. 1861, p. 452. Pilis appressis canescens vel cinereus; caulibus brevissimis; foliolis lanceolato-oblongis; capitulis paucifloris; calycis dentibus subulatis tubo longioribus; legumine oblongo-ovato magis inflato subcanescente dorso leviter impresso, sectione transversali obovata retusa sæpiusve basin versus late obcordata. —

Formæ duæ : *a. PEDUNCULOSUS*, normalis, pedunculis folia subæquantibus vel superantibus : *β. BRACHYPUS*, pedunculis brevissimis vel subnullis. — Plains of Texas and Nebraska to the Rocky Mountains and Hudson's Bay. Both forms are represented in Hall and Harbour's collection, no. 131. The form *β*, from the withered corolla being carried up on the apex of the growing legume, is perhaps precociously fertilized. It seems doubtful if the root is perennial. Mature legumes about an inch long ; when fresh or when dried without pressure the impression of the back of the legume is manifest enough, although shallower than in *A. villosus*, which is a true *Astragalus* ; while this would be taken for a *Phaca*.

§ 16. *Argophylli*. Legumen estipitatum (plerumque crasso-coriaceum et obcompressum), sutura dorsali impressa vel intrusa ventrali approximata pl. m. interstinctum, haud septato-bilocellatum, pubescens. — Humiles, albo-sericei vel canescentes. Stipulæ discretæ, fere liberæ. Flores spicati vel subcapitati, violacei vel purpurascens. Calycis dentibus tubo sæpius oblongo vel cylindrico brevioribus.

* Multicaulis e radice annua vel bienni ; floribus parvulis albo-purpurascens. Legumen inflatum, membranaceum, incurvum.

47. *A. PUBENTISSIMUS*, Torr. & Gray, Fl. 1, p. 693. *A. multicaulis*, Nutt. l. c., non Ledeb. Nanus, pube laxa hirsuto-canescens ; foliolis oblongis obovatisve ; floribus in pedunculo brevi paucis subracemosis ; calycis dentibus tubo campanulato æquilongis ; legumine villosa membranaceo inflato ovato-lunato valde incurvo dorso sulcato sutura leviter inflexa uniloculari. — Colorado Territory, near the sources of the Colorado of the West ; found only by Nuttall. Legumes 9 or 10 lines long, the ventral suture perhaps slightly, the dorsal more deeply sulcate-introflexed.

* * Simpliciter caulescens e radice annua ; floribus mediocribus violaceis. Legumen rectum ?

48. *A. ARTHU-SCHOTTII*, sp. nov. Pube appressa sericea undique incanus ; caule (spithamæo et ultra) erecto ; foliolis 4–9-jugis obovatis sæpe retusis, pagina superiore interdum glabrata ; floribus in pedunculo folium superante pluribus laxè spicatis ; calycis dentibus subulatis tubo oblongo-campanulato vix dimidio brevioribus ; carina majuscula subrecta vexillo paullo brevior ; legumine juvenili oblongo-lanceolato acuminato recto canescente e sutura dorsali semiseptato. —

Interior district between Utah and California; on the Mohave River, April 23, Fremont. Diluvial banks of the Colorado near its mouth, March 12, A. Schott. Boca Grande, Capt. E. K. Smith. — Specimens of this have accumulated enough to show that they belong to a quite distinct species, although only the forming fruit has come to hand. It was unnoticed in the Botany of the Mexican Boundary Survey.

* * * *Brevicaules* vel *subcaulescentes*, sæpiusque *depresso-humifusi* vel *cæspitantes* e radice longa perenni; floribus majusculis breviter pedicellatis plerumque violaceis; foliolis oblongis ellipticis obovatisve. Legumen crasso-coriaceum, maturum obcompressum vel obcompresso-trigonum transverse rugulosum. (*Argophylli genuini*.)

The immature legumes in dried specimens frequently appear as if compressed (i. e. flattened parallel with the valves); but when fully mature I believe they are always obcompressed (i. e. contrary to the valves), or, by the salience of the ventral suture and introflexion of the dorsal one, obcompressed-triangular.

49. *A. MISSOURIENSIS*, Nutt. Gen. 2, p. 99. *A. melanocarpus*, Fraser, Cat.; Richards. in Frankl. Journ.; Hook., etc. *Subcaulescens*, pube brevi appressissima cano-sericeus; pedunculis scapiformibus capitato-paucifloris vel spicato-8-14-floris; calycis dentibus tubo cylindrico vel cylindræo subdimidio brevioribus; corolla læte violacea (fide Nutt. raro alba); legumine fere recto (circiter pollicari) nigricante elliptico. — Nebraska and New Mexico to the Saskatchewan. — The short and appressed pubescence of the calyx and of the legume is usually of blackish and whitish hairs intermixed. The mature legumes, when preserved in their natural form, or restored by maceration, are obcompressed, oftener so that the dorsal suture touches the ventral, which, however, is externally salient or carinate. But in herbaria, they frequently appear as if laterally compressed, with the dorsal suture only slightly intrusive.

50. *A. SHORTIANUS*, Nutt. in Torr. & Gray, Fl. 1, p. 331, ex descr. *A. humilis*, Geyer ex Hook. in Lond. Jour. Bot. 6, p. 211, non Bieb. *A. cyaneus*, Gray, Enum. coll. Parry, Hall, & Harbour, no. 126. *Subacaulis*, pube appressissima sericeo-canescens; foliolis majusculis (lin. 7-10 longis) obovatis ovatisve; pedunculis scapiformibus pauciplurifloris foliis sæpius brevioribus; calyce cylindrico (semipollicari), dentibus tubo dimidio brevioribus; corolla violacea vel cyanea; legumine immaturo ovato-lanceolato crasso (sesqui-bipollicari) puberulo

arcuato-incurvo. — Rocky Mountains, about the head-waters of the Platte or Nebraska.

Var.? MINOR. *A. cyaneus*, Gray, Pl. Fendl. p. 34 (magna pro parte). Sæpe subcaulescens; foliis minoribus; legumine oblongo- seu lanceolato-lineari arcuato-incurvo postice profunde sulcato-introflexo. — Mountains and plains, from the southern frontier of New Mexico and W. Texas to Nebraska and the Rocky Mountains. — Probably only a smaller form of *A. Shortianus*, between that and *A. Missouriensis*, which it closely resembles (except in the fruit and in usually wanting dark hairs), and with which I have more than once confounded it. In fruit it is distinguished from that species by its long ($1\frac{1}{2}$ inches or more), pointed, and strongly arcuate legume. Its cross-section is obcordate-two-lobed, the intruded dorsal approaching the externally carinate ventral suture.

51. *A. PARRYI*, Gray, Enum. coll. Parry, in Sill. Jour. n. ser. 33, p. 410, & Enum. coll. Parry, Hall, & Harbour, in Proceed. Acad. Philad. March, 1863, p. 60. Brevicaulis, cæspitoso-humifusus, pilis laxis patentibus villosus; pedunculis breviusculis 6–10-floris; floribus laxè subcapitatis; calycis dentibus tubum oblongum subæquantibus; corolla albida seu flavidula (lin. 6–8 longa), carina apice purpurascens; legumine pubescente oblongo-lanceolato, maturo arcuatim incurvo demumve circinato valde obcompresso tam antice quam postice sulcato-impresso et propter suturas contiguas fere bilocellato. — Rocky Mountains, both low and subalpine, in Colorado Territory, and south to the Llano Estacado in N. W. Texas. I find in Dr. Torrey's herbarium a specimen collected by Fremont in his second expedition (station not recorded), with very ripe legumes: these are an inch or rather more in length, strongly rugulose, much obcompressed, and curved nearly into a ring. In Dr. Parry's specimens they are much less incurved and less rigid.

52. *A. GLAREOSUS*, Dougl. in Hook. Fl. Bor.-Am. 1, p. 152. *A. argophyllus*, Nutt. in Torr. & Gray, Fl. l. c. excl. syn. Cæspitoso-depressus, pilis incumbens albidis villosis-sericeis; pedunculis 3–6-floris folia haud superantibus; floribus angustis (lin. 9–12 longis); calycis dentibus tubo longe cylindrico triplo brevioribus; corolla læte violacea; legumine immaturo oblongo-ovato apice attenuato incurvo sericeo-pubescente, "maturo subglabro." — Dry gravelly banks of streams, in and near the Rocky Mountains, on the southern tributaries of the Columbia River, and of the Platte. In the herbarium, without

fruit, it is liable to be confounded with the two succeeding species, but its pubescence is hirsute-silky or villous-silky, not lanuginous; and the forming legume is canescent with short appressed pubescence.

Series II. Legumen sutura neutra introflexa plane uniloculare, aut sutura ventrali magis quam dorsalis intrusa. PHACA, L., DC.

1. Folia pinnato-plurifoliolata, rarius paucifoliolata vel abortu defoliolata, in nonnullis *Homalobis* simplicia.

§ 17. *Eriocarpis*. Legumen lanosissimum, plerumque sub lana longa copiosissima occultum, breve, turgidum, coriaceum, pl. m. incurvum, acuminatum vel apiculatum, estipitatum. — Brevicaules e radice valida perenni, humifuso-cæspitantes, mollissime lanuginosi. Flores elongati, sæpius pollicares, laxè subcapitati; calyce longe cylindrico.

53. *A. inflexus*, Dougl. in Hook. Fl. Bor.-Am. 1, p. 151. Lanugine laxa subvillosa cinereo-canescens; caulibus (6–12-pollicaribus) diffuso-procumbentibus; foliolis oblongis; floribus læte purpureis, carina dentes calycis graciles setaceos laxos paullo superante; legumine ovato-oblongo, juniore lanosissimo, maturo (in herb. Hook.) subdenudato maxime incurvo obcompresso suturis utrisque præsertim ventrali impressis longitudinaliter interstincto. — Barren grounds along the southern tributaries of the Columbia River; on the Clearwater, Rev. Mr. Spalding, &c. — Flowers fully an inch long, evidently purple or violet and showy. — This species, copiously collected by Mr. Spalding, with only forming fruit, I have variously confounded with the preceding on account of its purple flowers, and with the following on account of the woollier pubescence and the very woolly young pods. But on now comparing these materials with the description of *A. inflexus* by Sir William Hooker, and with a ripe pod from his herbarium, I think they may be united. From the mature legume it might as well be referred to the foregoing group; but here it is clearly the ventral suture which is intruded to meet the slightly impressed dorsal suture.

54. *A. PURSHII*, Dougl. in Hook. Fl. Bor.-Am. 1, p. 152. *Phaca mollissima*, Nutt. in Torr. & Gray, Fl. 1, p. 350. Lanugine laxa subvillosa cinereo-canescens, subacaulis vel humifuso-depressus; foliolis oblongis; floribus ochroleucis, carina apice purpurea dentibus calycis subulatis longius superante: legumine ovato (subpollicari) leviter incurvo, intus haud interstincto, lana persistente flavida. — Western side of the Rocky Mountains, through Utah and the interior of Oregon to the

mountains of California. — Flowers more or less smaller, and calyx-teeth much shorter and less attenuated than in the preceding.

55. *A. UTAHENSIS*, Torr. & Gray, Bot. coll. Gunnison & Beckwith, Pacif. R. R. Exped. 2, p. 120. *Phaca mollissima* β . *Utahensis*, Torr. in Stansbury, Rep. p. 385, t. 2. Lanugine implexa niveo-tomentosus, humifuso-cæspitans; foliolis obovatis seu orbiculatis; floribus violaceis; legumine oblongo leviter obcompresso modice incurvo, cæt. fere præcedentis. — Utah, on the shores of Great Salt Lake. — Flowers rather shorter, but otherwise as large as those of *A. inflexus*; the calyx-teeth rather as in *A. Purshii*; the pubescence, &c. peculiar. On stripping off the wool from the pods, they are seen to be not unlike those of *A. inflexus*, except that they are less curved, and only a little sulcate at the sutures, which do not meet to divide the cell.

§ 18. *Oocarpî*. Legumen chartaceo-coriaceum, ovatum, vesicario-inflatum, estipitatum, glabrum, sutura dorsali obsolete ventrali manifeste intrusa. — Glabrati, e radice perenni erecti, foliosi; stipulis discretis liberis; foliolis oblongis ovalibusque nunc retusis. Flores in racemo spiciformi plures albi seu albidi, semipollicares; calyce brevi. Legumina erecta, nec ultrapollicaria.

56. *A. COOPERI*, Gray, Man. Bot. N. U. S. ed. 2, p. 98. *Phaca neglecta*, Torr. & Gray, Fl. 1, p. 344. Ultrapedalis, foliosus; foliolis oblongis; floribus confertis mox reflexis albis; calyce nigricanti-pubescente, dentibus subulatis tubo brevioribus; legumine ovato-globoso sub-obcompresso antice posticeque leviter sulcato, sutura dorsali intus prominula, ventrali satis introflexa. — W. New York to Wisconsin along the Great Lakes. Legume lined with cobwebby hairs which traverse the cell.

57. *A. OOCARPUS*. *A. Crotalariae* (in tab. *crotalarioides*), Torr. Bot. Mex. Bound. p. 56, t. 17, non *Phaca Crotalariae*, Benth. Elatus (4–6-pedalis); foliolis ovalibus parvulis crassiusculis; floribus patentibus in racemo sublaxo; calycis albido-puberuli dentibus brevissimis; legumine oblongo-ovato acuto antice solum leviter sulcato sectione transversa circulari, sutura dorsali intus vix prominula, ventrali introflexa. — Mountains east of San Diego, California, Dr. Parry. — Legume rather firmly coriaceous, with a somewhat lateral or oblique contracted insertion, within glabrous.

§ 19. *Inflati*. Legumen membranaceum, vesicario-inflatum, globosum, oviforme, vel semi-ovatum, sæpius magnum, tenuiter reticulatum,

glabrum vel glabratum, sutura aut neutra aut rarius ventrali solum intus subintroflexa.

- * *Radix annua*. Legumen haud stipitatum, haud maculoso-pictum. Flores parvi, ochroleuci vel purpurascens. — Humiles: foliola linearia seu lineari-oblonga, striguloso-cinerea.

58. *A. TRIFLORUS*, Gray, Pl. Wright. 2, p. 45. *Phaca triflora*, DC. Astrag. t. 1? *P. Candolliana*, H.B.K. Nov. Gen. & Sp. 6, p. 495, t. 586. A basi ramosissimus; floribus in pedunculo 3–15 ochroleuco-purpurascens; legumine ovali obtuso vel acutiusculo (7–12 lin. longo). — Arizona and Mexico. Legumes larger and more inflated in specimens from the northern stations, otherwise like the Mexican specimens. The specific name not appropriate.

59. *A. GEYERI*. *Phaca annua*, Geyer in Hook. Lond. Jour. Bot. 6, p. 213. Simplicior; floribus in pedunculo paucis luteo-albis; legumine ovato-lunato acumine incurvo (lin. 8–9 longo). — Drift-sand plains of the Upper Platte, Geyer. Said also to have been collected by Douglas and by Gordon. The crescentic outline and sharp acumination of the legume distinguishes this from the last. The leaflets are linear. There is an obscure *A. annuus*.

- * * *Radix filiformis*, aut annua? aut perennis (in *A. Hookerianus* adhuc ignota). Legumen maculosum, in albido seu viridulo purpureo-pictum, stipite brevi calycem adæquante sustentum. Flores in pedunculo pauci, parvuli, albo-rosei seu pallidi; carina apice inflexo subproducto.

60. *A. PICTUS*. *Phaca longifolia*, Torr. & Gray, Fl. & *P. picta*, Gray. Pube sericeo-strigulosa canescens, arenicolus; radice tenuissima (ut videtur nunc annua, nunc forte perenni surculos filiformes subterraneos proferente); stipulis subulatis rigidis persistentibus ad-versus folium basi connatis; foliolis anguste linearibus seu filiformibus, plerisque sæpius abortivis petiolo persistente folium filiforme mentiente; legumine pendulo ovoideo vix apiculato. — Nebraska and New Mexico, in drift-sand, "binding the sand-hills with its long filiform roots." — The name *filifolius*, which I had applied to one form of this species (see below) on remanding it to the genus *Astragalus*, is preoccupied by Clos in the Flora Chilena. That of *pictus*, so appropriate for the legume, may be adopted; for "*A. pictus*, Steud." is merely a name to replace "*A. bicolor*, Desf. Cat. addend.," of which no character was ever published, which has been overlooked in the Flora Chilena, and is

doubtless a synonyme of some described Chilian species. The following two forms are pretty clearly of one species.

Var. FOLIOLOSUS. *Phaca picta*, Gray, Pl. Fendl. p. 37. Folia perfecta ; foliolis 3 – 7-jugis plerisque semipollicaribus ; legumine parvulo vix ultra semipollicari.

Var. FILIFOLIUS. *Psoralea longifolia*, Pursh. Fl. 2, p. 741. *Orobis longifolius*, Nutt. Gen. 2, p. 95. *Phaca longifolia*, Torr. & Gray, Fl. 1, p. 346. *Astragalus filifolius*, Gray, in Pacif. R. R. Surv. 12, pars 2, Bot. t. 1, A. Folia sæpius imperfecta ; foliolis perpauca plerumque attenuatis (1 – 1½ poll. longis), terminali seu rhachi filiformi producto persistente ; legumine 1 – 1½-pollicari.

61. A. HOOKERIANUS. *Phaca Hookeriana*, Torr. & Gray, Fl. 1, p. 693. Sericeo-pubescent, humilis (spithamæus) ; radice verosimiliter perenni ; stipulis subscariosis discretis ; foliolis lineari-oblongis subcuneatis 7 – 9-jugis ; legumine erecto magno (bipollicari) oblongo-obovato apice rotundato basi in stipitem brevem attenuato. — Interior of Oregon, Douglas ; station unknown. Legume beautifully mottled. Species somewhat like *P. arenaria*, Pall.

* * * Radix perennis. Legumen unicolor (haud maculoso-pictum).

+ Subacaulis, pauciflorus ; legumen brevissime stipitatum.

62. A. MEGACARPUS. *Phaca megacarpa*, Nutt. in Torr. & Gray, Fl. 1, p. 343. Glabellus ; foliolis 4 – 6-jugis late ovalibus ovatisve sæpius emarginatis ; scapo 3 – 6-floro foliis multo brevioribus ; floribus pollicaribus ochroleucis albidisve ; calycis cylindracei dentibus subulatis elongatis carina paullo brevioribus ; legumine ovato-oblongo acuminato 2 – 2½-pollicari basi obtusissimo stipite calyce multoties brevior inserto erecto. — Plains of the Rocky Mountains ; found only by Nuttall. No other North American species resembles it.

+ + Caulescentes, sat alti, foliosi ; foliolis multijugis oblongis vel sublinearibus ; racemis spicisve plerumque plurifloris. Præter *A. frigidum* Californici.

++ Legumen nunquam stipitatum, ultrapollicare, sæpius 1½ – 2-pollicare, sutura ventrali recta vel convexiuscula, dorsali valde gibbosa.

a. Corolla flava vel flavescens, parvula, brevis, supra calycem incurva ; carina inflexa. Pedunculi folia haud superantes.

63. A. DOUGLASSII. *Phaca Douglasii*, Torr. & Gray, Fl. 1, p. 346 ; Hook. & Arn. Bot. Beech. p. 334. Adsurgens, subglaber vel puberulo-subcinereus ; stipulis triangularibus discretis ; foliolis 10 – 14-jugis

lineari-oblongis lanceolatisve apice obtuso vel apiculato; racemis brevibus laxifloris; dentibus calycis lato-subulatis tubo brevioribus; legumine gibboso-ovoideo, sutura ventrali fere recta. — California, near the coast, Douglas, Fremont, Brewer.

64. A. MACRODON. *Phaca macrodon*, Hook. & Arn. l. c. Adscendens vel erectus, villosulo-canescens, nunc glabriusculus; stipulis lanceolato-subulatis discretis; foliolis 11–14-jugis lineari-oblongis apice obtuso mucronato; racemis breviusculis; floribus demum deflexis; dentibus calycis sericei filiformi-subulatis laxis tubo æquilongis corolla (flavida) paullo brevioribus. — California, Douglas; in flower only. — A specimen with forming fruit, like that of the foregoing, collected by Dr. Gibbons, is ambiguous between the two, being glabrate, but with the calyx-teeth nearly of the present species, and with subulate rigid stipules.

b. Corolla alba vel ochroleuco-purpurascens, e calyce longius exserta, recta apice subincurva, alarum et carinarum unguibus lamina subæquilongis. Pedunculi folia superantes: racemi elongandi, multi- et conferti-flori, floribus mox deflexis. Foliola multijuga, conferta, apice sæpius retusa, infima cauli approximata.

65. A. CROTALARIÆ. *Phaca Crotalaria*, Benth. Pl. Hartw. p. 307? *P. densifolia*, Torr. Bot. Whipl. Exped. (Pacif. R. R. Surv. 4, p. 24, 80), non Smith. Glabratus vel subglaber; caule valido adscendente; stipulis triangularibus discretis; foliolis aut lineari- aut obovato-oblongis petiolulatis (6–16 lin. longis); corolla alba; legumine ovoideo 1–1½-pollicari chartaceo (rigidiori et minus inflato quam subsequenter). — California. Near Monterey, Coulter, if the plant here described be really Mr. Benthams species, as I am disposed to conclude, from a study of sketches and notes kindly furnished by him. But the specimens here described are by no means canescently pubescent, nor should I quite term their legumes “sub-coriaceous,” although the mature ones are considerably firmer in texture than those of the related species, — chartaceous they may be called: moreover, the teeth of the calyx are much shorter than the tube in Coulter’s plant, little shorter than the tube in our specimens; yet the following species shows a similar diversity in this respect. The flowers of Coulter’s plant, moreover, seem to be fewer, and the leaflets more cuneate-obovate; in all ours they are oblong. (It is certain that Coulter’s plant is not that figured by Dr. Torrey, our no. 57.) The materials before me are from the three following sources. Near San Francisco?

Dr. Gibbons, received from the late Dr. Darlington, with both flowers and ripe fruit. Cocomungo, Dr. Bigelow, from Dr. Torrey, with flowers and fruit. Valley of San Inez River, near Santa Barbara, Dr. Brewer, in the State Geological Survey; in flower and with forming fruit. In all these the leaves and stems are glabrous, except some scattered appressed hairs, especially on younger parts; the calyx sometimes considerably pubescent. Flowers 6 to 8 lines long.

66. A. MENZIESII. *Phaca densifolia*, Smith; Hook. Ic. t. 283, excl. syn. Nutt. *P. inflata*, Nutt. mss., non Gill. *P. Nuttallii*, Torr. & Gray, Fl. l. c. Villosa-canescens; caule decumbente glabrescente; stipulis scariosis adversus folium connatis; foliolis subcuneato-oblongis subsessilibus; legumine ovoideo "fere biunciali" tenui-membranacea. — California, near Monterey, Santa Barbara, &c. — There is an *Asragalus densifolius* of Lamarck.

++ ++ Legumen brevi-stipitatum (stipite calycem adæquante); cæterum præcedentium. Stipulæ scariosæ folium adversus fere ad apicem usque (summis exceptis) connatæ.

67. A. CURTIPES (Gray in Proceed. Acad. Calif. ined.), sp. nov. Pube appressa minuta canescens, demum glabratus; caule erecto pedali; stipulis coalitis majusculis; foliolis 12–16-jugis oblongis seu lineari-oblongis retusis petiolulatis supra glabris; racemo fructifero brevi; calycis dentibus tenui-subulatis tubo campanulato parum brevioribus; legumine sesquipollicari puberulo glabrato semi-ovoideo (sutura ventrali fere recta, dorsali maxime gibbosa) utrinque vix acutato cum stipite rigido calycis tubum adæquante articulado. — San Luis Obispo, California, on the side of a dry hill, April 13th. Dr. Brewer. Corolla not seen.

++ ++ ++ Legumen longiuscule vel longissime stipitatum, $\frac{2}{3}$ –1½-pollicare, sutura ventrali convexiuscula recta vel concaviuscula. Stipulæ discretæ. Flores albi seu flaviduli, rectiusculi.

a. Stipes leguminis (basi haud vel parum attenuati) calycem longe superans. Pedunculi folium longe excedentes, racemo brevi oblongo terminati. Stipulæ parvæ.

68. A. LEUCOPSIS, Torr. & Gray, Bot. Mex. Bound. p. 56, t. 16. *Phaca canescens*, Nutt. in Torr. & Gray, Fl. 1, p. 344. *P. leucopsis*, Torr. & Gray, l. c. p. 694. Tomentuloso-canescens demumve cinereus; foliolis 10–18-jugis oblongis vel sublinearibus obtusis retusisve; dentibus calycis subulatis tubo brevi-campanulato dimidio brevioribus;

corolla ochroleuca; legumine glabro (subpollicari vel sesquipollicari) basi in stipitem calyce bis longiorem subattenuato. — Coast of California from Santa Barbara southward. — Calyx more or less pubescent, not silky. Ovary canescent. Legume often appearing as if acute or acutish at the apex, more so at the base. Stipe slender, five or six lines long.

69. A. LEUCOPHYLLUS, Torr. & Gray, Fl. 1, p. 236. *Phaca leucophylla*, Hook. & Arn. Bot. Beech. p. 333. Sericeo-incanus; foliolis 10–18-jugis lato-linearibus lanceolatisve obtusis vel acutiusculis; dentibus calycis sericei attenuato-subulatis tubo oblongo dimidio brevioribus; corolla ut videtur flavescens; legumine demum glabro (sesquipollicari) ovali-gibboso utrinque obtusissimo, stipite gracillimo ultra calycem prælonge (pollicem) exserto. — California, probably in the northern part of the State. The fruit is now known from the collection of Wilkes's Exploring Expedition (Sacramento Valley) and of a correspondent of the Rev. John Blake. Ovary silky-canescens, this pubescence remaining on the filiform stipe, which is fully as long as the half-grown legume.

70. A. TRICHOPODUS. *Phaca trichopoda*, Nutt. in Torr. & Gray, l. c. Cinereo-puberulus, glabratus; caule sesqui-tripedali; foliolis 12–19-jugis lineari-oblongis obtusis; calycis nigricanti-pubescentis dentibus subulatis tubo campanulato multo brevioribus; corolla ochroleuca; ovario glaberrimo; legumine ellipsoideo utrinque obtusissimo haud pollicari stipite tenuissimo e calycem prælonge (semipollicem) exserto paullo longiore. — California, Santa Barbara and Monterey, Nuttall, Dr. Gambell, Dr. Brewer. Flowers $4\frac{1}{2}$ to nearly 6 lines long. Legumes only two thirds or three fourths of an inch long, much less gibbous than in the related species, a line from base to apex being nearly axial; the ventral suture only slightly convex to near the apex, where it is strongly convex. Stipe minutely pubescent.

b. Stipes calycem brevius superans. Legumen utrinque acutatum.

71. A. OXYPHYSUS (Gray in Proceed. Acad. Calif. ined.), sp. nov. Elatus, mollissime canescenti-villosus; stipulis scariosis; foliolis 8–11-jugis oblongis, junioribus incanis, adultis viridescens; pedunculis folium longe superantibus; racemo elongato; bracteis subulatis parvis; calycis sericei dentibus subulatis tubo cylindraceo dimidio brevioribus; corolla "alba seu viridulo-alba" (lin. 9 longa); legumine obovato-clavato glabrato apice acute acuminato basi longe attenuato, stipite recurvo calycem parum superante. — California, Arroyo del Puerto, in

the Mt. Diablo range, on dry hills, June 11, in flower and fruit. Dr. Brewer. — A most distinct and striking species, apparently at least three feet high ; the younger parts white, the older grayish with soft, villous pubescence. Larger leaflets an inch long. Flowers narrow. Legumes an inch and a half to two inches long, in the dried specimens all much flattened laterally and margined by the two nerviform sutures (the ventral one more or less convex), the general outline being nearly semi-obovate with an attenuated base and a sharp-pointed apex : but the pods are evidently inflated in the fresh plant, and therefore more clavate. The texture of the walls is that of a thin parchment-like membrane. Seeds numerous. Stipe 3 or 4 lines long, pubescent.

72. *A. FRIGIDUS*. *Phaca frigida*, L. Pedalis bipedalisve, subglaber ; stipulis ovato-oblongis membranaceis ; foliolis 7 – 9-jugis ovato-oblongis seu elliptico-oblongis viridibus ; pedunculis folium adæquantibus ; dentibus calycis abbreviatis ; corolla alba ; legumine oblongo utrinque acutato in stipitem calyce æquilongi vel longiori attenuato nigro-piloso vel in stirp. Amer. glaberrimo. — Rocky Mountains to the Arctic regions and the northern parts of the Old World.

§ 20. *Lonchocarpæ*. Legumen membranaceum, lanceato-cylindricum, rectum, exserte stipitatum, glabrum, sutura neutra intrusa. Flores majusculi, calyce cylindræco. Foliola pauca vel subnulla.

73. *A. LONCHOCARPUS*, Torr. & Gray, Bot. Whipl. Exped. in Pacif. R. R. Surv. 4, p. 24 (80). *Phaca macrocarpa*, Gray, Pl. Fendl. p. 36. Cinereo-puberulus, glabratus ; caule fistuloso bipedali ramoso e radice perenni ; stipulis discretis parvis ; foliis 1 – 5-foliolatis quandoque ad rhachin complanato-filiformem reductis ; foliolis filiformi-linearibus remotis ; racemis plurifloris laxis ; bracteis pedicello dimidio brevioribus ; floribus pendulis albis ; dentibus calycis lato-subulatis tubo quadruplo brevioribus ; legumine (sesquipollicari) elongato-cylindrico, utrinque acutissime acuminato, stipite calycem excedente. — New Mexico, near Santa Fé.

The plant from the Llano Estacado, with shorter and blunt pods, collected by Dr. Bigelow, and noticed in the Pacific R. R. Survey, above cited, is not included in the character here given. When better known, it may prove to be a second species of this group.

§ 21. *Microcystei*. Legumen membranaceum vel chartaceum, parvum, globosum seu ovatum, vesicario-inflatum, estipitatum, sutura neutra introflexa. — E radice perenni diffusi vel procumbentes, plerique tenelli. Flores parvi, sæpius pauci.

74. *A. MICROCYSTIS*, sp. nov. Cinereo-pubescens, e radice lignescente procumbens; caulibus gracilibus ramosissimis; stipulis scariosis connatis summisve fere liberis; foliolis 4–6-jugis oblongis seu oblongo-lanceolatis obtusis; racemis 5–12-floris gracilibus; calycis pilosi dentibus setaceo-subulatis tubo brevi-campanulato æquilongis; corolla violacea seu albo-violaceo, vexillo profunde emarginato alas paullo carinam incurvam bis superante; legumine inflato globoso-ovato tenui-membranaceo griseo-pubescente lin. 3 longo. — Interior of Washington Territory, Fort Colville to the Rocky Mountains, Dr. Lyall (ex herb. Kew. no. 4, 5, 6). — This has the aspect of *A. sparsiflorus*; and the flowers are similar; but the fruit is quite different, neither suture being at all introflexed, and resembling the *Inflati* on a very small scale.

75. *A. LEPTALEUS*. *A. (Phaca) pauciflorus*, Gray, Enum. coll. Parry, Hall, & Harbour, l. c. no. 141, non Hook. *Phaca pauciflora*, Nutt. in Torr. & Gray, Fl. 1, p. 348, fide herb. Durand. Fere glaber; caulibus tenellis adscendentibus (spithamæis); stipulis basi subconnatis elongato-subulatis; foliolis 7–11-jugis lanceolato-linearibus oblongisve sæpe acutis; pedunculis folio brevioribus 2–4-floris; calycis nigropilosuli dentibus subulatis tubo campanulato parum brevioribus; corolla alba, vexillo emarginato carina apice violacea tertia parte longiore; legumine ovato seu ovali puberulo chartaceo (lin. 4 longo) sub-obcompresso? — Valleys of the Rocky Mountains, in South Park, &c. — Flowers about 4 lines long, on pedicels about the length of the calyx-tube and of the subulate bract. Herbage tender: said to be a good forage plant where abundant; but it is small and slender. Nuttall states that he has seen but a single specimen, and that not in flower. There is only one specimen named by him in the Philadelphia collections, viz. in Mr. Durand's herbarium, and that is in flower only.

76. *A. THURBERI*, Gray, Pl. Thurb. p. 312, & Bot. Mex. Bound. p. 56. Pube minuta cinereus; caulibus suberectis (6–10-pollicaribus); stipulis discretis scariosis parvis; foliolis 6–7-jugis lineari-oblongis retusis crassiusculis; racemis spicisve laxe 10–20-floris in pedunculo brevi; dentibus calycis subulatis tubo parum brevioribus; corolla albidula; legumine coriaceo-membranaceo globoso glabello (lin. 3 diametro). — Arizona, on dry plains. — Flowers barely 3 lines long, on very short pedicels.

§ 22. *Bisulcati*. Legumen coriaceum, e calyce per stipitem brevem exsertum, leviter obcompressum, antice concavum, recessu sutura cariniformi maxime prominente percurso. — Glabelli vel glabri;

radice perenni ; stipulis discretis liberis. Flores mediocres leguminaque penduli seu patentes. Calycis dentes tubo campanulato vix breviores, setacei. Carina subrecta.

77. A. BECKWITHII, Torr. & Gray, in Pacif. R. R. Surv. 2 (coll. Beckwith), p. 120, t. 3. Glaber, humilis, diffusus ; foliolis late ovalibus ; floribus in racemo brevissimo 5 – 8 albis ; legumine ovali (pollicari) subincurvo acumine lato compressissimo apiculato, dorso planiusculo sutura levissime sulcata et intus tumida, ventre impresso sutura exserta acutissime marginata. — Utah. The legume described from a fruiting specimen communicated to the late Dr. Darlington by Capt. J. W. Phelps. — From the dorsal suture forming a slight internal ridge on that side of the cell, while the ventral is altogether externally salient, this would technically fall into the *Astragalus* rather than the *Phaca* series. But the conformation of the legume is more like that of *A. bisulcatus* than any other.

78. A. BISULCATUS, Gray, in Pacif. R. R. Surv. 12, pars 2, (Bot.) p. 38, t. 1, B. *Phaca bisulcata*, Hook. Fl. Bor.-Am. 1, p. 145. Striguloso-puberulus ; caule erecto ultrapedali valido ; foliolis oblongis sæpe angustis, imis stipulis approximatis ; racemis spiciformibus densifloris ; floribus violaceis ; legumine parvulo (semipollicari) recto anguste oblongo semicylindrico antice profunde bi-excavato. — Plains of Nebraska to the Saskatchewan and to the Rocky Mountains. — The ventral suture forms a strong and salient obtuse ridge of the same height as the borders of the deep excavation it divides.

§ 23. *Pectinati*. Legumen crasso-cartilagineum epicarpio subcarnoso, subovatum vel oblongum, turgidum, estipitatum, nec antice nec postice sulcatum vel intrusum, suturis crassis utrisque extus prominentibus. — Caules subpedales e radice perenni, foliaque rigidiusculi ; foliolis fere filiformibus rhachi haud articulatis persistentibus. Stipulæ inferiores adversus folium connatæ. Flores elongati (subpollicares) in racemo breviusculo plurimi, albi, carina rectiuscula.

(From the legume *A. microlobus* may be sought here.)

79. A. PECTINATUS, Dougl. *Phaca pectinata*, Hook. Fl. Bor.-Am. 1, p. 141, t. 54. Puberulo-cinereus, glabratus ; ramis striatis angulatis ; calycis dentibus tubo cylindraceo multo brevioribus ; vexillo elongato ; legumine pendulo glabro (semipollicari) cuspidato, sutura dorsali percrassa. — Dry plains, Nebraska to Saskatchewan.

§ 24. *Scytocarpî*. Legumen coriaceum, ovatum seu oblongum, rarius cylindricum, turgidum, nec antice nec postice sulcatum, sutura neutra introflexa. (Inter se valde diversi.)

(Here probably *A. microlobus*, no. 32, might also be sought.)

* Legumen stipite crasso calycem subæquante sustentum. Flores magni (pollicares), calyce cylindraceo.

80. *A. PREUSSII*, sp. nov. Fere glaber, e radice perenni? ultrapetalis; caule erecto; stipulis ovatis discretis; foliolis 6–8-jugis carnosulis subrotundis quandoque retusis (semipollicaribus); racemis spiciformibus brevibus plurifloris; bracteis ovatis parvis; dentibus calycis subulatis tubo 3–4-plo brevioribus; corolla ut videtur purpurea, carina subrecta alis paullo brevior, vexillo elongato; legumine ovali-oblongo recto duriuscule coriaceo inflato (pollicari) glaberrimo apiculato basi subito in stipitem validum contracto. — Banks of the Rio Virgen, a tributary of the Colorado in Nevada, near the eastern borders of California, in loose saline soil. Fremont, in second expedition, 1844. — A well-marked species, named in memory of Fremont's able assistant in all his earlier explorations, Mr. Charles Preuss. The only specimen is preserved in Dr. Torrey's herbarium. A pretty stout, large-flowered species, with firm, leathery, Baptisia-like pods, which are strictly one-celled, without introflexion.

* * Legumen haud vixve stipitatum.

— Fere acaulescens, argenteo-sericeus, grandiflorus, radice perenni.

81. *A. CHAMÆLEUCE*, Gray in Bot. Ives' Colorado Exped. p. 10. *Phaca pygmæa*, Nutt. in Torr. & Gray, Fl. 1, p. 349. Cæspitoso-depressus (1–2-pollicaris); foliolis 2–5-jugis obovatis ovalibusque cano-sericeis; scapis brevibus 3–8-floris; calycis dentibus subulatis tubo cylindrico multoties brevioribus; corolla albo-violacea ($\frac{3}{4}$ -pollicari); legumine ovato-oblongo crasso-coriaceo (epicarpio subcarnoso?) tereti subarcuato puberulo (pollicari). — Upper waters of the Colorado of the West.

— — Humiles e radice annua seu bienni, canescentes, parviflori; stipulis discretis.

82. *A. TEPHRODES*, Gray, Pl. Wright. 2, p. 45. Incano-villosus; caulibus perbrevis; stipulis scariosis triangulari-ovatis; foliolis 7–12-jugis oblongis ovalibusque; pedunculis scapiformibus folia demum superantibus spicato-plurifloris; calycis dentibus tubo campanulato di-

midio brevioribus ; corolla purpurea ; legumine pubescente arcuato-ovato dorso gibboso acuto chartaceo-coriaceo (semipollicari et ultra). — New Mexico, Wright, Thurber, Bigelow. — Stems only an inch or two in length ; the peduncles at length three inches long. Flowers rather small.

83. *A. ARIDUS*, sp. nov. Sericeo-canescens ; caulibus spithamæis e radice annua diffuso-erectis foliosis ; stipulis minutis ; foliolis 5 – 6-jugis oblongis utrinque albo-sericeis ; pedunculis spicato-5 – 8-floris folio brevioribus ; calycis dentibus tubo brevi-campanulato brevioribus ; corolla ochroleuca, minima (2 – 2½ lin. longa) ; legumine canescente gibboso-ovato (semipollicari) tenui-coriaceo inflato. — Interior Californian desert, on the route between the mouth of the Gila River and San Diego, Prof. Thurber. The materials are scanty. Perhaps the species has a truly membranaceous legume, and should rather be associated with *A. Thurberi*.

+ + + Piloso-sericeus, e radice perenni decumbens ; floribus medio-ocribus ; stipulis scariosis adversus folium connatis.

84. *A. SONORÆ*, Gray, Pl. Wright. 2, p. 44. Caulibus gracilibus decumbenti-diffusis prostratisve ; foliolis 7 – 8-jugis oblongo-linearibus lanceolatisve acutatis pilis valde adpressis utrinque canescenti-sericeis ; pedunculis folio longioribus spicato-8 – 12-floris ; calycis dentibus setaceis tubo campanulato æquilongis ; corolla incurva purpurea, carina inflexa apice rostratim producta ; legumine canescenti-puberulo ovato-lunato acuminato turgido (semipollicari) chartaceo-coriaceo, suturis extus prominentibus. — On the borders of Arizona and the Mexican province of Sonora. — Flowers 4 or 5 lines long.

+ + + + Glabelli seu pubescentes ; caules e radice perenni adsurgentes vel erecti, sæpius flexuosi ; stipulis plerumque discretis ; floribus parvis, in unica majusculis ; leguminibus sæpe patentibus vel pendulis, stipite brevissimo in calyce occulto. Dentes calycis cinereo- vel nigricanti-pubescentis tubo breviores.

++ Legumina ovali-oblonga, inflata, subpollicaria, chartaceo-coriaceo.

85. *A. GRACILENTUS*. *Phaca gracilentæ*, Gray, Pl. Fendl. p. 36. Pube appressa subcanescens, erectus, subpedalis ; foliolis oblongo-linearibus basi attenuatis ; racemis laxifloris ; corolla purpurascens (lin. 4 longa) ; legumine oblongo utrinque obtuso rectiusculo cinereo-pubescente in calyce arcte sessili. — Santa Fé, New Mexico, on rocky hills.

86. A. FENDLERI, Gray, Pl. Wright. l. c. *Phaca Fendleri*, Gray, Pl. Fendl. l. c. Glabellus vel pube appressa puberulus, erectus, ultrapetalis; foliolis oblongis seu lineari-oblongis; racemis longe pedunculatis laxifloris; corolla purpurea (lin. 4 longa); legumine ovali inflato recto apiculato minute puberulo, stipite brevissimo. — New Mexico, in the Mountains, &c.

87. A. HALLII, sp. nov. (*A. Phacæ debili* aff., Gray, Enum. coll. Parry, Hall, & Harbour, l. c. no. 121.) Subcinereo-pubescent, glabratus; caulibus pedalibus adsurgentibus; stipulis subulatis; foliolis 9–12-jugis angusto-oblongis subcuneatis retusis; pedunculis folium superantibus racemo densifloro capituliformi terminatis; floribus majusculis (lin. 7–8 longis); calycis nigricanti-pubescent dentibus latiusculis tubo campanulato basi gibboso 3–4-plo brevioribus; corolla violacea; legumine oblongo inflato glaberrimo recto apiculato stipite calyce triplo breviori suffulto. — Valleys of the Rocky Mountains of Colorado Territory, lat. 39°–41°, coll. Hall & Harbour, no. 121. — Stems rather stout. Leaflets 4–7 lines long. Flowers 20 or more in an open head or short and dense raceme, the rhachis in fruit at most an inch and a half long. Calyx broadly campanulate, very gibbous at the base, 3 lines long, the short teeth rather obtuse. Corolla straightish. Ovary very glabrous. Legume 7–10 lines long, very turgid, its short but distinct stipe about a line long. — This very well-marked species occurs in no other collection that I am aware of. Comparison with an original specimen of the little-known *Phaca debilis* of Nuttall does not confirm my former suspicion that this might be a larger form of that species. It may therefore appropriately bear the name of the assiduous discoverer.

++ ++ Legumina lineari-oblonga, cylindrica, tenui-coriacea.

88. A. FLEXUOSUS, Dougl. in Hook. Fl. Bor.-Am. 1, p. 141. *Phaca elongata* & *P. flexuosa*, Hook. l. c. Cinereo-puberulus, adsurgens, pedalis; foliolis oblongo-vel cuneato-linearibus obtusis retusisve; pedunculis folium superantibus; racemis plerisque elongatis laxis; calycis canescenti-pubescent dentibus tubo triplo brevioribus; corolla albida vel purpurascens (lin. 4 longa); legumine cylindraceo (8–11 lin. longo lin. 2 diametro) puberulo apiculato recto vel subincurvo, stipite calyce occulto brevissimo sed manifesto. — Plains of Nebraska Territory to the Saskatchewan and the borders of the Rocky Mountains.

§ 25. *Podo-sclerocarpi*. Legumen crasso-cartilagineum, exserte stipitatum, compressum, incurvum, suturis valide incrassatis nequaquam intrusis a valvis demum secedentibus marginatum. — Perennes, ramosi, cinereo-puberuli, arenicolæ, stipulis parvis discretis.

89. A. SCLEROCARPUS. *Phaca podocarpa*, Hook. Fl. Bor.-Am. 1, p. 142. Ramosissimus, fere canescens; foliolis 6–9-jugis linearibus; racemis laxis; floribus albis; legumine canescenti-puberulo lunato nunc fere hamato acumine cuspidato basi in stipitem validum calyce bis terve longiorem attenuato, valvis rigidissimis turgidis rugulosis. — Dry, sandy barrens at the Great Falls of Columbia River, Douglas, and lately collected by Dr. Lyall, with ripe fruit. This when well formed is an inch long, and with the stipe not much shorter; the very thick valves become strongly convex. There is an *A. podocarpus* of long standing.

90. A. SPEIROCARPUS, sp. nov. Subcinereus, semipedalis; foliolis 4–9-jugis oblongis retusis; racemis paucifloris; legumine glabrato lineari-lanceolato complanato spiraliter 1–2-cyclo, stipite calycem bis superante. — Wenass, in the valley of the Upper Columbia River, Dr. Lyall, ex herb. Kew. In fruit only: the legume coiled like that of a *Medicago*. — The sutures, at least the thick ventral one, may be seen to separate more or less from the mature fruit in *A. gracilis*, *microlobus*, and I believe in *A. pectinatus*. In this and the preceding, both sutures become at length more or less detached, as in certain *Mimoseæ*.

§ 26. *Homalobi*. Legumen Viciæ- seu Ervi-forme complanatum vel pl. m. compressum, rectum, suturis nerviformibus nequaquam intrusis marginatum, coriaceum vel chartaceum, quandoque stipitatum. — Perennes, alii pinnatifolii foliolis pluribus paucisve, alii simplicifolii, habitu diversi. (*Homalobus* et *Kentrophyta*, Nutt.)

* *Genuini*; floribus in racemis spicisve pedunculatis; leguminibus pluri-(7–20-)ovulatis.

+ Stipulæ ut videtur omnes discretæ. Legumen exserte longeque stipitatum. Calycis dentes tubo 3–4-plo breviores. Caulescentes, plerumque ultrapedales, pinnatifolii, plurifoliolati.

91. A. COLLINUS, Dougl. in Hook. Fl. Bor.-Am. 1, p. 141. *Phaca collina*, Hook. l. c. Subcinereo-pubescentis pube laxa, erectus vel diffusus; foliis linearibus seu oblongo-linearibus obtusis basi attenuatis; pedunculis folio duplo longioribus; racemo brevi oblongo confertifloro; floribus in pedicello suberecto retrofractis; calyce oblongo-

campanulato vel cylindraceo basi gibboso albido-pubescente, dentibus triangulari-subulatis; corolla fere alba calyce vix duplo longiori, vexillo carinam alasque subsuperante; legumine pubescente lineari-oblongo turgido basi in stipitem calyce bis longiorem attenuato. — Subalpine range of the Blue Mountains, Oregon, Douglas. On the Kooskooskie River, Dr. Pickering in Wilkes, Expl. Expedition (with fruit). Columbia Valley, Dr. Lyall, in flower. Described from the last two collections. Corolla purple according to Don, white with a purple spot on each petal according to Hooker, who had Douglas's notes. Legume an inch long including the stipe.

92. *A. FLIPES*, Torr. in Bot. S. Pacif. Expl. Exped. ined. Appresse-puberulus; caule gracili paniculato-ramoso; foliolis subremotis angustissime linearibus parvis (lin. 3–4 longis); pedunculis gracillimis folio multo longioribus; racemo sparsifloro; floribus in pedicello erectiusculo vel recurvo-patente nutantibus; calyce campanulato haud gibboso albido-puberulo, dentibus subulatis; corollæ albæ? vexillo carinam paullo superante; legumine fere glabro lineari-oblongo complanato basi in stipitem calyce ter longiorem angustato. — Interior of Washington Territory, near Fort Okanagan, Dr. Pickering in coll. Expl. Exped. — Flowers smaller than those of the preceding, and the legume apparently flat, an inch or rather less in length without the slender stipe, which commonly curves upwards out of the reflexed or spreading calyx.

93. *A. STENOPHYLLUS*, Torr. & Gray, Fl. 1, p. 329. *A. leptophyllus*, Nutt. in Jour. Acad. Philad. 7, p. 18, non Desf. Glaber, erectus; foliolis anguste linearibus (6–8 lin. longis); pedunculis folium bis superantibus; racemo oblongo 10–16-floro; floribus patentibus; calyce campanulato nigricanti-pubescente, dentibus latiusculis obtusissimis; corolla “purpurascens” seu alba, vexillo carina longiori; ovario glabro stipite vix æquilongo. — Rocky Mountains at the headwaters of the Missouri, Wyeth. Fruit unknown, but probably pertaining to this section. Ovary strictly one-celled.

+ + Stipulæ pleræque, saltem inferiores, adversus folium connatæ.

Legumen pl. m. stipitatum. Caulescentes, pinnatifolii, semper plurifoliolati. Dentes calycis tubo dimidio breviores.

94. *A. MULTIFLORUS*. *Ervum multiflorum*, Pursh, Fl. 2, p. 789. *Astragalus tenellus*, Pursh, Fl. 2, p. 473, pro parte, ex Pursh. *Orobis dispar*, Nutt. Gen. 2, p. 95. *Phaca nigrescens*, Hook. Fl. Bor.-Am. *Homalobus dispar* & *H. nigrescens*, Nutt. in Torr. & Gray. *H. multiflorus*, Torr. & Gray, Fl. 1, p. 351. *Astragalus (Phaca) nigrescens*,

Gray in coll. Hall & Harbour, no. 115. Subglaber; caulibus adsurgentibus vel diffusis (sub- vel sesqui-pedalibus) ramosis; stipulis superioribus basi tantum connatis; foliolis 6–10-jugis angusto-oblongis linearibusque obtusis nunc mucronatis; racemis brevi-pedunculatis plurifloris laxis; floribus flavido-albis, carina rectiuscula alis brevior obtusissima apice nunc purpureo tincta; legumine oblongo plano glabro chartaceo (circiter semipollicari) stipite calycem subæquante rarius superante suffulto. — Plains of Nebraska to Mackenzie River (lat. 65°) and the Rocky Mountains. — The earliest specific name is fortunately not preoccupied in *Astragalus*, and may be adopted. It is only in Nicolle's specimens that I have seen the stipe much exceeding the calyx, — in these fully twice its length; but there is no clear distinction, either by the leaflets or the legumes, between Nuttall's two supposed species.

95? *A. BOURGOVIE*, sp. nov. Striguloso-pubescent; caulibus e caudice lignescente adsurgentibus (spithamæis); stipulis fere omnibus alte connatis scariosis; foliolis 7–8-jugis oblongis lanceolatisve acutatis; pedunculis folia multo superantibus; racemo brevi 5–10-floro; pedicellis tubo calycis nigro-pubescent subæquilongis; corolla violacea, carina apice inflexa subproducta alas adæquante; legumine immaturo ovato-lanceolato nigro- vel cinereo-pubescente stipite brevi calyce incluso suffulto. — Rocky Mountains on the British Boundary, Bourgeau, in Palliser's expedition (ex herb. Kew.). — Mature fruit unknown, perhaps turgid and not of this section. The forming legume is rounded at the base, on a very short included stipe, the dorsal suture not at all introflexed. Flowers $4\frac{1}{2}$ or 5 lines long, apparently deeply colored: vexillum a little exceeding the wings and large keel. Calyx oblong-campanulate, acute at the base, the teeth rather stout. — I had taken this for the *A. vaginatus* of Richardson and Hooker. But I am informed that Richardson's specimen in the Hookerian herbarium is different, and has been referred by Planchon to *Phaca australis*.

96. *A. PALLISERI*, sp. nov. Parce striguloso-pubescent, glabratus; caulibus (subpedalibus) e caudice lignescente adsurgentibus ramosis gracilibus rigidulis; stipulis superioribus herbaceis discretis; foliolis 4–9-jugis linearibus lanceolatisve obtusiusculis; pedunculis folium æquantibus; racemo sparsi-(7–12-)floro; pedicellis calyce brevi æquilongis; corolla albedo-purpurascente, carina apice angustata inflexa violacea alis brevior; legumine lineari ($\frac{2}{3}$ – $\frac{3}{4}$ -pollicari lineam lato) glaberrimo stipite brevissimo at manifesto calyce incluso suffulto,

valvis turgidis. — Rocky Mountains on the British Boundary, probably not at great elevations, Bourgeau, in Palliser's expedition (ex herb. Kew.). — Leaflets 7 to 12 lines long, a line or a line and a half wide, rather rigid. Calyx short-campanulate, the teeth not half the length of the tube, often still shorter. Corolla $4\frac{1}{2}$ to 5 lines long, curved; the carina produced into a narrow inflexed tip. Legume scarcely if at all exceeding a line in width, straight. It has a short stipe hidden in the calyx, like that of *A. flexuosus*, which is the species of *Scytocarp*i most approaching the *Homalobi* in the narrowness of its pod, and which the present species somewhat resembles. But the flowers of this are larger, and differ much in the narrow and inflexed tip to the keel. The pods with turgid valves resemble those of *A. collinus*. But its near affinity is with *A. campestris* and *A. decumbens*, from which the glabrous legumes, on a manifest though short stipe, distinguish it.

+ + + Stipulæ pleræque, saltem inferiores, adversus folium connatæ.
Legumen nunquam stipitatum. Caulescentes.

++ Calycis dentes gracillimi tubo sublongiores. Humiles e caudice lignescente, omnino pinnatifolii; stipulis omnibus pl. m. connatis.

97. *A. PAUCIFLORUS*, Hook. Fl. 1, p. 149. Multicaulis, pumilus, cinereo-pubescens; caulibus cæspitanti-decumbentibus conferte foliosis stipulis majusculis; foliolis 3–5-jugis oblongis lanceolatisve acutis pedunculis folium subæquantibus 2–5-floris; floribus approximatis racemosis patentibus; corolla violacea, carina breviter incurva obtusissima alis satis vexillo dimidio brevioribus; legumine lineari-oblongo complanato sericeo-puberulo (lin. 4–5 lin. longo). — Elevated regions of the Rocky Mountains, near the British Boundary. The fruit, that of a genuine *Homalobus*, is described from Bourgeau's specimens. Corolla $4\frac{1}{2}$ to 5 lines long, curved, the large vexillum reflexed.

98. *A. MISER*, Dougl. in Hook. Fl. Bor.-Am. 1, p. 153, adn.? Multicaulis, cinereo-puberulus; caulibus diffusis (spithamæis) gracilibus laxè foliatis; stipulis majusculis, superioribus ad medium connatis; foliolis lato-linearibus oblongisve plerumque obtusis; pedunculis folium longe superantibus 5–12-floris; floribus in racemo sparsis; corolla et calyce fere præcedentis; legumine juvenili ovato-oblongo canescente. — Valley of Columbia River, Dr. Lyall (ex herb. Kew.), and, if the same, of its tributary the Spokane, Douglas. Described from Dr. Lyall's specimens (no. 7), and (the fruit being wanting) referred here on account of its resemblance to the preceding species. Douglas's

name may as well be taken up for this species from the same district. No specimens named by Douglas are extant.

++ ++ Calycis dentes aut breves aut tubo subæquantes. Stipulæ superiores fere discretæ. Graciles, rigiduli, ramosi, pinnatifolii vel abortu subsimplicifolii, nunc petiolis nudis. Racemi laxiflori, longius pedunculati. Flores ochroleuci, nunc purpureo suffusi; carina præsertim violaceo tincta vexillo parum brevior.

99. A. CAMPESTRIS. *Homalobus campestris* & (forma depauperata) *H. tenuifolius*, Nutt. in Torr. & Gray, Fl. 1, p. 351. *H. decumbens*, Gray in Enum. coll. Parry, Hall, & Harbour, no. 142, non Nutt. Striguloso-cinereus, nunc glabrescens; caulibus adsurgentibus (3 – 15-pollicaribus); petiolis subcomplanatis rigidis sæpius 9 – 13-foliolatis, summis raro paucifoliolatis nudisve; foliis lanceolatis linearibus seu lineari-subulatis plerumque acutis; racemis 5 – 10-floris; calycis dentibus tubo dimidio brevioribus; carina apice inflexa longe rostratim producta; legumine oblongo-lineari (subpollicari) puberulo, valvis sub-turgidis. — Colorado Territory, in valleys on both sides of the Rocky Mountains. — Variable in size and in the leaflets, but well marked by the long and narrow falcately inflexed tip to the carina. Flowers rather large, fully 5 lines long when well developed, yellowish-white, usually tinged with violet.

100. A. SEROTINUS, Gray in Pacif. R. R. Surv. 12, 2, p. 47, t. 5. Cinereo-puberulus, glabratus; caulibus adsurgentibus (9 – 18-pollicaribus); petiolis omnibus pluri-(9 – 21-)foliolatis; foliis linearibus; racemis virgatis 9 – 20-floris; calycis dentibus brevissimis (tubo 3 – 4-plo brevioribus); carina apice brevi subangustata inflexa; legumine lineari fere glabro. — On the Okanagan near the Columbia River, lat. 48°, Oct., Dr. J. G. Cooper. — Flowers tinged with purple, almost as large as in the preceding species, but the carina very different, having a much shorter and broad inflexed tip. From the next species the distinctions are not so certain, being chiefly the less pubescence and the short calyx-teeth.

101. A. DECUMBENS. *Homalobus decumbens*, Nutt. l. c. Cinereo-vel sericeo-pubescent; caulibus diffusis vel adscendentibus (6 – 10-pollicaribus); petiolis nunc subcomplanatis plerisque pluri-(7 – 13-)foliolatis; foliis lineari-lanceolatis acutis; racemis 5 – 10-floris; calycis dentibus attenuatis tubo parum brevioribus; carina apice brevi inflexa; legumine lato-lineari recto vel falcato (subpollicari) canes-

centi-puberulo. — On both sides of the Rocky Mountains in Colorado Territory, and farther northward. — Corolla 4 or $4\frac{1}{2}$ lines long, ochroleucous, sometimes with a purplish tinge.

102. A. DIVERSIFOLIUS. *Homalobus orthocarpus*, Nutt. l. c. Striguloso-cinereus; caulibus diffuso-decumbentibus elongatis (pedalibus); petiolis brevibus complanatis 1–5-foliolatis; foliolo terminali seu folio simplici lineari elongato (1–2-pollicari) utrinque attenuato; pedunculis 1–5-floris; calycis dentibus tubo dimidio brevioribus; carina falcato-incurva; legumine oblongo-lineari recto vel subfalcato ($\frac{3}{4}$ -pollicari) canescenti-puberulo. — Gravelly plains of Colorado Territory, on both sides of the Rocky Mountains. — Flowers ochroleucous or lurid. — There is an *A. orthocarpus* of Boissier; and moreover the pods of this, as of the foregoing species, are often more or less falcate.

103. A. JUNCEUS. *Homalobus junceus*, Nutt. l. c. Striguloso-cinereus; caulibus erectis paniculato-ramosis; petiolis filiformibus aphyllis, “radicalibus foliola 1–2-juga minima gerentibus”; pedunculis paucifloris; calycis dentibus brevissimus obtusis; legumine lineari recto canescenti-puberulo. — Colorado Territory, on the head-waters of the Colorado of the West. — The only extant specimen of this in American herbaria, that I can find, is one in Dr. Torrey’s herbarium, given by Nuttall, out of flower, and bearing a single legume, which is nearly an inch long. If distinct (and I know not to what other of the group it could be united), it may retain Nuttall’s specific name, the *A. junceus* of Ledebour being a synonyme of *A. Stevenianus*.

+ + + + Stipulae scariosae; folium adversus in unum connatae. Legumen breve, nunquam stipitatum, oligospermum. Acaulescentes, caespitosi, sericeo-canescens; foliis simplicibus lanceolato-vel spathulato-linearibus, nonnullis raro 3–5-foliolatis; scapis folia superantibus plurifloris; corollis purpureis vel roseis.

104. A. CAESPITOSUS. *Homalobus caespitosus*, *brachycarpus*, & *canescens*, Nutt. l. c. Late caespitans; scapis 2–6-pollicaribus; racemo spiciformi; calycis dentibus attenuatis tubo subaequilongis; carina obtusissima vexillo multo brevior; legumine oblongo seu lato-lanceolato vix curvato (lin. 3–5 longo) subplano. — Dry hills and cliffs of the Platte or Nebraska, towards the Rocky Mountains. — Ovary and legume more or less canescent in Nuttall’s specimens of his three species, which are all evidently reducible to one; while the ovary is glabrous in a specimen collected at Scott’s Bluffs by Mr. W. H. Wagner.

* * *Condensati*; floribus e rosulis foliorum simplicium vix exsertis; leguminibus pluriovulatis subturgidis suturis validioribus marginatis.

105. A. SIMPLICIFOLIUS. *Phaca simplicifolia*, Nutt. l. c. Pulvinato-cæspitosus; foliis lineari-vel spathulato-lanceolatis rigide acutis sæpius involutis sericeo-incanis ramos breves caudicis multicipitis dense obtegentibus; scapis brevissimis inclusis demum subexsertis; calycis glabrati dentibus tubo oblongo dimidio brevioribus; corolla parvula ochroleuca; legumine calyce semi-incluso oblongo acuto subcompresso glabro crasso-coriaceo, sutura ventrali recta acutissima, dorsali gibbosa. — Rocky Mountains of Colorado Territory near the sources of the Platte, found only by Nuttall. — Legume four lines long, of thicker texture and more turgid than in the preceding species, and with more prominent sutural edges, but formed on the same plan; the foliage also similar. Ovules about 12.

* * * *Submonospermi*, depresso-caulescentes; floribus in axillis foliorum subsessilibus; leguminibus 3–4-ovulatis sæpius monospermis ovatis haud stipitatis. Pinnatifolii, paucifoliolati.

106. A. KENTROPHYTA, Gray, Enum. coll. Parry, Hall, & Harbour, l. c. no. 106. *Kentrophyta montana* & *K. viridis*, Nutt. in Torr. & Gray, l. c. Intricato-ramosus e radice longa, late depresso-cæspitosus, undique foliosissimus, sericeo-canescens; stipulis folium adversus plerisque connatis; foliis pinnato-3–7-foliolatis; foliolis lineari-subulatis divaricatis rigidis mox involutis spinula terminatis cum rhachi haud articulatis persistentibus; floribus in axillis 1–3 parvis cæruleo-albidis ochroleucisve; legumine ovato acuminato compresso tenui-coriaceo canescente parvo (lin. 3 longo) bivalvi basi calyce brevi stipato suturis vix marginato. — Colorado Territory, on both sides of the Rocky Mountains, especially on the upper part of the Platte or Nebraska, in denuded or sandy places.

2. Folia quasi palmato-trifoliolata. (*Phaca* § *Orophaca*, Torr. & Gray.)

§ 27. *Triphylli*. Legumen conico-ovatum, acuminatum, nec stipitatum nec compressum, coriaceum, pluriovulatum, calyce subinclusum, sutura neutra intrusa. — Perennes, e caudice multicipiti lignescente cæspitosi, depressi, argenteo-sericei, confertifolii; stipulis majusculis tenui-scariosis adversus petiolum connatis ramos imbricantibus. Folia simulate palmatim re vera pinnatim trifoliolata, infima rarissime bijugatim 5-foliolata, foliolis confertis.

107. A. TRIPHYLLUS, Pursh, Fl. 2, p. 740. *Phaca cæspitosa*, Nutt. Gen.; Hook. Fl. Bor.-Am. t. 55. *P. argophylla*, Nutt. in Torr. & Gray, l. c. Acaulescens, nitido-sericeus; stipulis hyalinis glabris; foliis primariis quandoque 5-foliolatis foliolis cuneato-oblongatis, sequentibus longe petiolatis foliola 3 longiora lanceolata gerentibus flores (pollicares) sessiles confertos superantibus; calycis dentibus tubo cylindrico dimidio brevioribus; corolla ochroleuca seu alba; legumine villosa calyce incluso. — Plains of Nebraska to the Saskatchewan. — Even the trifoliate leaves may be seen on close examination to be of the pinnate type, and not of the palmate, as I had supposed. Some of the earlier leaves of the season (which, by their shorter petioles and shorter and broader leaflets, exemplify Nuttall's *Phaca argophylla*), moreover, show two pairs of leaflets and a terminal one, crowded indeed, but evidently pinnate. Pursh's name is to be restored to the species, the homonym of Pallas being an *Oxytropis*.

108. A. SERICOLEUCUS, Gray, Enum. coll. Parry, in Sill. Jour. n. ser. 33, p. 410, no. 190. *Phaca sericea*, Nutt. in Torr. & Gray, Fl. l. c. Latissime cæspitosus, sericeo-incanus; caulibus ramosis prostratis; ramis stipulis villosis obtectis; foliis omnibus trifoliolatis pedunculos filiformes 2–6-flos haud æquantibus; foliolis oblongatis cuneato-oblongisve (lin. 3 longis); calycis dentibus tubo campanulato subæquilongis; corolla purpurea (lin. 3–4 longa); legumine ovato-oblongo incano calyce semi-incluso (lin. 3 longo). — Sand-hills and cliffs of the Platte or Nebraska to the Rocky Mountains.

III. Species anomala, carina in acumen producta *Oxytropidis* instar, legumine sutura dorsali (carinali) solum introflexa Astragalorum typicorum.

109. A. NOTHOXYS, sp. nov. Diffusus e radice annua, cinereo-puberulus; caulibus gracilibus (3–12-pollicaribus); stipulis fere liberis discretis; foliolis 6–9-jugis obovato-oblongis oblongisve sæpe retusis supra glabris; pedunculis folium superantibus; racemo brevi spiciformi; calycis dentibus subulatis tubo oblongo brevioribus; corolla violacea, carina apice lato incurvo in acumen acutissimum desinente; legumine lato-lineari falcato puberulo tenui-coriaceo dorso sulcato septifero fere bilocellato, sutura ventrali extus prominula. — Arizona, formerly the northern part of the Mexican province of Sonora, Prof. Thurber. San Luis Mountain and Guadalupe Cañon, Capt. E. K. Smith, in herb. Torr. — Leaflets 3 to 6 lines long. Peduncles 3 to 6

inches long. Flowers about half an inch long. Legume 8 to 11 lines long, transversely venulose, many-seeded, considerably resembling that of *A. Nuttallianus*, with which (notwithstanding the obvious differences) some of the specimens were confounded in the Botany of the Mexican Boundary Survey. The broad and short, moderately incurved apex of the carina is abruptly contracted into a short, very acute, porrected cusp, which would technically refer the plant to *Oxytropis*.

* * * *Obscure Species.*

A. DIAPHANUS, Dougl. in Hook. Fl. Bor.-Am. 1, p. 151, — from near the Great Falls of the Columbia River, — described as having linear, somewhat diaphanous, bilocellate legumes, I have not identified. I learn that the plant has the aspect of *A. distortus*.

A. COULTERI, Benth. Pl. Hartw. p. 307, near Monterey, California, with silky-villous bilocellate legumes, would seem to belong to the section *Argophylli*.

A. POLARIS, Benth. in Hook. f., Arct. Pl. (Linn. Trans. 33, p. 323), from Kotzebue's Sound, is said to differ from *A. alpinus* not only in the size (an inch long) and upright direction of the legume, and the obsolete stipe, but also in the absence of any introflexion of the dorsal suture.

PHACA DEBILIS, Nutt. in Torr. & Gray, Fl. 1, p. 345, from the Rocky Mountains, is known to me only by a flowering specimen in herb. Torr. In appearance, and in the size of the flowers, it seems intermediate between *A. Hallii* and *A. flexuosus*; but it is dwarf, and has shorter calyx-teeth than either. The legume is a desideratum.

PHACA PARVIFOLIA, Nutt. l. c. p. 348, I find no specimen of; but conjecture that it may, like Nuttall's *P. parviflora*, have been founded on *P. elegans*, Hook., which is the small-flowered, American variety of *A. oroboides*.

Among *Astragali* which remain undetermined for want of sufficient materials are the following: —

1. A striking one collected, in blossom only, by Capt. Pope, on the Llano Estacado, with a head or short spike of large yellowish flowers. It is mentioned in the Botany of Pope's Exploration; Pacif. R. R. Surv. 2, p. 163.

2. The plant, in flower only, described as a variety of *A. Fremontii*, in Pacif. R. R. Surv. 4, p. 80 (24), collected by Dr. Bigelow on the Mohave, but which is certainly different from Fremont's plant there

characterized. Dr. Parry gathered the same species on the Gila, still without fruit.

3. A canescent, narrow-leaved species from "Tubac, Sonora, Parry," which in the Bot. Mex. Bound. Surv., p. 56, was referred to *A. Sonoræ*. Capt. E. K. Smith collected the same species at Los Nogales, Sonora, also without fruit.

4. A plant mentioned in Torr. & Gray, Fl. 1, p. 694, under *Phaca leucophylla*, from Douglas's last collection, of which the legumes only are known; these are ovate-oblong, rather cartilaginous than coriaceous, entirely one-celled.

OXYTROPIS, DC.

The few North American species of *Oxytropis* of which materials are before me appear to be as follows:—

A. *Calyx fructifer vesicarius*.

§ 1. *Calycophysæ*. (*Physocalyx*, Nutt. ined.) Calyx fructifer vesicario-inflatus, globosus, legumen ovatum chartaceo-membranaceum sutura ventrali solum intrusa sub-semibilocellatum includens. Pulvinato-cæspitosæ, subacaules: scapi biflori.

1. *O. MULTICEPS*, Nutt. in Torr. & Gray, Fl. 1, p. 341; Gray in Enum. coll. Parry, Hall, & Harbour, no. 144 (forma minor). *Physocalyx multiceps*, Nutt. in herb. Rocky Mountains.—The legume of this most rare and charming little alpine species resembles that of *O. pumila*, Fischer, but is short-stipitate, and concealed in the persistent bladdery calyx.

B. *Calyx immutatus*.

§ 2. *Physocarpæ*. Legumen vesicario-inflatum, membranaceum, sutura ventrali solum intus tumida vel intrusa. Acaulescentes: scapi umbellato- seu capitato-2–6-flori.

2. *O. PODOCARPA*. *O. arctica*, Hook. Fl. Bor.-Am. 1, p. 146, pro parte, non R. Br. *Astragalus biflorus*, Schweinitz in herb. Depressocæspitosa, multiceps, albo-villosa, demum glabrescens; stipulis petiolo longe adnatis; foliolis 5–11-jugis crebris lineari-lanceolatis seu oblongo-linearibus (lin. 2–4 longis); pedunculis folia adæquantibus bifloris; corollæ (subcæruleæ?) carina brevi-mucronata; legumine (subpollinari) oblongo-ovato tenui-membranaceo subglabro acutissime acuminato stipite gracili calycem adæquante sustento.—Labrador, Arctic regions, and Rocky Mountains, lat. 49°. The specimens before me are from

Labrador, good flowering specimens in the herbarium of Schweinitz; from Arctic America, one in Dr. Torrey's herbarium, ticketed "*O. campestris* (Parry) by Sir William Hooker (which may perhaps be his *O. campestris* var. *melanocephala*, but the short peduncles are at most two-flowered), and one from Richardson named by him *O. arctica*; from the Rocky Mountains, Sir William Hooker's *O. arctica* ♂, of Drummond's collection;—all the above in blossom only; and, finally, a fruiting specimen of the latter from Bourgeau's collection. This, with its thin-walled inflated legume on a slender stipe (which stipe is evident enough in such flowers of the above as I could venture to dissect), is thus shown to differ essentially from the original *O. arctica*, which has the coriaceous nearly sessile legume, along with other characters of *O. Uralensis*. The present species is surely more nearly related to *O. physocarpa*, Ledeb., differing however in its stipitate and pointed pod, and in the merely conjugate, but much crowded leaflets.

§ 3. *Campestris*. Legumen coriaceum seu chartaceum, nec vel parum vesicarium, in calyce sessile vel substipitatum, sutura ventrali septifera fere vel semi-bilocellatum, sutura dorsali raro subintrusa. Acaules: stipulæ petiolo alte adnatæ: scapi raro 2–4-flori, sæpius pluriflori; floribus capitatis spicatisve; leguminibus erectis.

* Foliola conjugata.

+ Scapi 2–5-flori.

3. *O. URALENSIS*, L. var. *PUMILA*, Ledeb. Fl. Alt. *O. arctica*, R. Br.; Hook. pro parte. *O. Uralensis*, var. *arctica*, Ledeb. Fl. Ross. *O. lagopus*, Nutt. in Torr. & Gray, Fl. — Arctic shores and islands; and Rocky Mountains to about lat. 40°, Nuttall, Hall and Harbour, no. 143. — I can well believe that this is an arctic-alpine form of *O. Uralensis*. The legumes are oval-oblong or elongated-oblong, with the partition from the ventral suture stretching across to the dorsal. But neither in this nor in Siberian specimens of genuine *O. Uralensis* (I have no fruiting European) do I detect any wing or rudiment of a septum projecting from the dorsal suture, as described by authors.

+ + Spicæ vel capitula plurifloræ.

4. *O. CAMPESTRIS*, L., cum syn. Ledeb. & Hook. f. *O. viscida*, Nutt. in Torr. & Gray (*O. mollis*, Nutt. herb., forma viscidulo-villosa). Legumina chartacea, ovata seu ovato-oblonga, subinflata. Flores lutescentes, violaceo suffusi vel picti, rarius cærulei. Foliola plurijuga, oblongo-lanceolata, haud sericeo-canescens. — Arctic regions to Lab-

rador, Maine, and Rocky Mountains, lat. 40°. In legumes of European *O. campestris*, but not in the plant of Maine, I find a slight internal projection of the dorsal suture; also, that the septum from the other suture divides the cell, except when the legume is considerably inflated. From the observations of Ruprecht, Ledebour, and others, it would seem that *O. campestris*, *argentata*, and *Uralensis* all run together. Equally they appear to run into the next in the Saskatchewan and Rocky Mountain region.

5. O. LAMBERTI, Pursh. *O. Hookeriana?* *Plattensis* & *sericea*, Nutt. in Torr. & Gray. Legumina coriacea, nunc fere cartilaginea, arrecta, oblongo-cylindræa seu elongato-cylindræa (lin. 2–3 lata, longiora pollicem longa), septo e sutura ventrali fere bilocellata. Flores majusculi seu magni (8–12 lin. longi), spicati, purpurei, violacei, ochroleuci, seu albi. Foliola plurijuga, lanceolata, oblonga, vel linearia, cum calycibus canescenti-sericea. Stipulæ plerumque hirsutissimæ seu lanatæ. — Plains of Saskatchewan to Texas and the Rocky Mountains. I am unable to compare this with the Siberian *O. grandiflora*.

6. O. NANA, Nutt. in Torr. & Gray, l. c. *O. argentata*, Pursh. Fl.? non Pall. Cæspitoso-multiceps; folia confertissima, magis cano-sericea; foliola 3–4-juga. Flores 9–12, capitati, majusculi. — Rocky Mountains about lat. 40°, Nuttall; and farther north on Little Blackfoot River, Dr. Cooper; in flower only. Legumes unknown.

* * Foliola pleraque subverticillata.

7. O. SPLENDENS, Dougl. in Hook. A well-marked and beautiful, silvery silky-villous species. Plains of Nebraska to Bear Lake, and west into the Rocky Mountains.

§ 4. *Montana*. Legumen tenuiter coriaceum, oblongum seu cylindraceo-elongatum, in calyce breviter vel brevissime stipitatum, sutura ventrali late impressa (haud vero septifera) sub-semibilocellatum. Caulescentes vel subacaules, pedunculis scapiformibus: stipulæ præsertim superiores basi tantum petioli adnatæ: foliola crebra: flores læte cærulei, spicati seu capitati, parvuli (tubo calycis brevi), patentes; leguminibus sæpius patentibus seu deflexis.

8. O. DEFLEXA, DC. *O. foliolosa*, Hook., forma fere acaulis. — Saskatchewan to the Rocky Mountains, as far south as about lat. 40°. (Fine specimens in Parry, Hall, and Harbour's collection, no. 120.) The only species of this group yet detected in America.